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RESPONSE ACTION PLAN FOR VAPOR INTRUSION ASSESSMENT

**Operable Unit 2 North Penn Area 5 Superfund Site
Administrative Settlement and Order on Consent
for Removal Response Action
Docket No. CERC-03-2014-0060AC**

Submitted on Behalf of

Stabilus, Inc.
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Project Number PH0055

2 April 2014

2 April 2014

Via Email and Federal Express

Ms. Sharon Fang (3H521), Remedial Project Manager
U.S. Environmental Protection Agency – Region III
1650 Arch Street
Philadelphia, PA 19103

**Subject: Response Action Plan (RAP) for Vapor Intrusion (VI) Assessment
Operable Unit 2 North Penn Area 5 Superfund Site
Administrative Settlement and Order on Consent for Removal Response Action
Docket No. CERC-03-2014-0060AC**

Dear Ms. Fang:

On behalf of Stabilus, Inc., please find enclosed three (3) copies of the Response Action Plan (RAP) dated 2 April 2014 to document methods and procedures for a vapor intrusion assessment to be performed at the Constantia-Colmar, Inc. facility building located at 92 County Line Road in Colmar, Pennsylvania. This RAP was prepared in accordance with the Administrative Settlement and Order of Consent for Removal Response Action Docket No. CERC-03-2014-0060AC dated 14 March 2014, and to specifically fulfill the requirements of Section VIII, Paragraph 44 of the Settlement Agreement. If you have any questions, please do not hesitate to contact me.

Sincerely,



Derek W. Tomlinson, P.E.
Project Coordinator

Attachment: Response Action Plan (RAP) dated 2 April 2014

cc: Dennis Kutz, PADEP (*via email & 1 hardcopy first class mail*)
M. Joel Bolstein, Esq., FoxRothschild
Chris Voci, P.G., Geosyntec
File: PH0055

CERTIFICATION

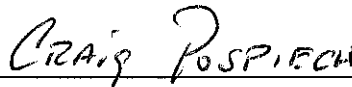
Except as provided below, I certify that the information contained in or accompanying this Response Action Plan is true, accurate, and complete.

As to those portions of this Response Action Plan for which I cannot personally verify their accuracy, I certify under penalty of law that this Response Action Plan and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

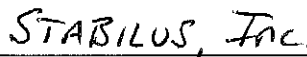
Signature: _____



Name: _____



Company: _____



Title: _____



Date: _____



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LIST OF ACRONYMS

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CH ₄	methane
CO ₂	carbon dioxide
COCs	chemicals of concern
FS	Feasibility Study
FSP	Field Sampling Plan
ft bgs	feet below ground surface
HASP	Health and Safety Plan
HVAC	heating, ventilation and air conditioning
in	inch
in-H ₂ O	inches of water column
L	liter
µg/L	microgram per liter
µg/m ³	microgram per cubic meter
mL/min	milliliter per minute
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NELAP	National Accredited Laboratory Accreditation Program
NP5	North Penn Area 5
NPWA	North Penn Water Authority
NPL	National Priorities List
OSHA	Occupational Safety and Health Administration
OU	operable unit
OU1	Operable Unit 1
OU2	Operable Unit 2

OU3	Operable Unit 3
O ₂	oxygen
PADEP	Pennsylvania Department of Environmental Protection
PID	photoionization detector
ppm	part per million
PRAP	Proposed Remedial Action Plan
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RA	response action
RAP	Response Action Plan
RI/FS	Remedial Investigation and Feasibility Study
ROD	Record of Decision
SOP	standard operating procedure
SSP	sub-slab sample point
TCE	trichloroethene, trichloroethylene
THA	task hazard analysis
UAO	Unilateral Administrative Order
USEPA	United States Environmental Protection Agency
VI	vapor intrusion
VOCs	volatile organic compounds

1. INTRODUCTION

This Response Action Plan (RAP) was prepared by Geosyntec Consultants, Inc. (Geosyntec) on behalf of Stabilus, Inc. (Stabilus) to document methods and procedures for a vapor intrusion (VI) assessment to be performed at the Constantia-Colmar, Inc. (Constantia) facility building located at 92 County Line Road in Colmar, Pennsylvania (“Facility”). Constantia is presently engaged in manufacturing operations at the Facility, which is located within Operable Unit 2 (OU2) of the North Penn Area 5 Superfund Site in Hatfield and New Britain Townships, Montgomery and Bucks Counties, Pennsylvania (referred herein as the “Site” or “NP5”, Figures 1 and 2).

This document was prepared in accordance with the Administrative Settlement and Order of Consent for Removal Response Action Docket No. CERC-03-2014-0060AC dated 14 March 2014 (“Settlement Agreement”; USEPA, 2014) between Stabilus and Constantia (collectively referred to as “the Respondents”) and the U.S. Environmental Protection Agency (USEPA), with effective date of 19 March 2014. This RAP is being submitted to the USEPA pursuant to Section VIII, Paragraph 44 of the Settlement Agreement.

1.1 Scope of Work

The activities to be completed as part of the VI investigation are as follows:

- Conduct pre-sampling communication with the USEPA and the Facility operator;
- Perform a building survey to document building conditions and completion of an inventory of chemical products used within the Facility;
- Collect six (6) sub-slab soil gas samples within the southern one-third of the Facility as required by the Settlement Agreement;
- Prepare monthly progress summary reports; and
- Based on the results of the sub-slab soil gas sampling, prepare either a Final Report or a Supplement to the RAP (RAP Supplement) for additional sampling or preemptive mitigation.

1.2 Report Organization

The RAP is organized into the following sections:

- **Section 1:** Introduction;
- **Section 2:** Background Information;
- **Section 3:** Conceptual Model for Vapor Intrusion;
- **Section 4:** Field Sampling Plan;
- **Section 5:** Quality Assurance and Quality Control;
- **Section 6:** Reporting;
- **Section 7:** Health and Safety;
- **Section 8:** Schedule; and
- **Section 9:** References.

2. BACKGROUND INFORMATION

A summary of the Site location and relevant geologic and hydrogeologic information is set forth below. More detailed background information on the Site can be found in the Settlement Agreement, the Interim ROD (USEPA, 2011), and the Intermediate Design Submittal (60% Design; Geosyntec, 2014).

2.1 Site Location

The Facility is located at 92 County Line Road in Colmar, Pennsylvania, which is within the NP5 Site. NP5 is located within Hatfield and New Britain Townships, in Montgomery and Bucks Counties, Pennsylvania (Figure 1). NP5 encompasses an area of approximately five square-miles that is generally bounded by Richardson Road to the southeast, Bethlehem Pike (Route 309) to the west, Trewigtown Road to the northwest and Schoolhouse Road to the east (Figure 2). For NP5, three primary areas of groundwater contamination were identified and defined as separate and distinct operable units (OUs). The Facility is located within OU2 of the NP5 Site. A depiction of the Facility building layout is provided on Figure 3.

2.2 Site Geology and Hydrogeology

The Site is located within the Triassic Lowlands section of the Piedmont Physiographic Province and is underlain by sedimentary rocks of the Brunswick and Lockatong Formations of the Newark Supergroup. The lower beds of the Brunswick Formation consist of red to reddish brown and gray to greenish-gray mudstones, clay, and mud-shale. The Lockatong Formation rocks are thinly-bedded and evenly-bedded shale and siltstone that are medium to dark gray and olive to greenish-gray.

Bedrock beneath the Site is mantled with 10 to 30 feet thick overburden (regolith) comprised of silt, clay, and some sand. Site-specific investigations confirm that the bedrock surface beneath the OU2 overburden forms a trough or shallow basin. This feature is significant with respect to the overburden thickness and the resulting distribution of TCE in saturated soils. The overburden is largely unsaturated, but does contain groundwater at its base above the bedrock, especially during periods of higher seasonal recharge. Groundwater originates from infiltration of local precipitation through the overburden into the bedrock fracture network. The depth to groundwater in this overburden unit has historically ranged from 4 to 10 feet below ground surface (ft bgs). OU2 overburden generally flows in a northwesterly direction with a shallow

horizontal gradient in overburden of 0.01 ft/ft. A detailed description of regional and Site geology and hydrogeology is provided in the 60% Design (Geosyntec, 2014).

3. CONCEPTUAL MODEL FOR VAPOR MIGRATION

The Settlement Agreement determined that an investigation was needed to determine whether VI was a pathway of concern at the Facility. The VI potential and potential exposure pathways of the Site compounds of concern (COCs) and their applicable standards are discussed within the context of the conceptual site model (CSM) below.

3.1 Conceptual Site Model

As part of the RD for implementation of the Interim ROD, groundwater sampling was conducted in 2013 as part of the Pre-Design Investigation (PDI) to further delineate the TCE contamination plume within the OU2 overburden groundwater aquifer (Geosyntec, 2014). Analysis of groundwater samples taken at the Site proximate to the southern wall of the Facility revealed TCE concentrations of approximately 7,800 micrograms per liter ($\mu\text{g/L}$) in the overburden groundwater. This is above the USEPA groundwater screening level threshold of 5 $\mu\text{g/L}$ for the vapor intrusion pathway. Based upon the PDI results, the 5 $\mu\text{g/L}$ TCE isoconcentration contour is presented on Figure 4. As is evident, the TCE within the OU2 overburden groundwater aquifer exceeding the 5 $\mu\text{g/L}$ threshold is along the southern portion of the Facility.

A southwest trending bedrock trough at the southern end of the Facility was confirmed during completion of the PDI, which correlates to locations of the higher observed TCE concentrations (Geosyntec, 2014). The TCE concentrations within the OU2 overburden aquifer are lower where the overburden aquifer thins and higher within the thicker overburden sequence.

The soils within the OU2 overburden are characterized by low permeability based upon observations and measurements made during completion of the PDI (Geosyntec, 2014). This low permeability limits the lateral and vertical movement of vapor within the subsurface. Additionally, rainwater infiltration through the grass-covered overburden over the years has the potential to form a clean water lens above the zone of elevated TCE concentrations within the subsurface. The combination of lower soil permeability and a clean water lens may limit if not eliminate the possibility of vapor migration within the subsurface.

3.2 Contaminants of Concern

As presented in the Interim ROD, a comprehensive list of COCs for OU2 at the Site is summarized on Table 1. Included on the table are the detection limits (DLs) for each contaminant, the reporting limits (RLs) for USEPA Method TO-15, and appropriate Inhalation Regional Screening Levels (RSLs) for each compound of concern assuming an Industrial Inhalation Cancer Risk Screening Level RSLs of 1E-06 and the Industrial Inhalation Non-Cancer values at a hazardous index (HI) of 0.1.

3.3 Exposure Pathways

Groundwater with dissolved VOCs can flow beneath present or future buildings. VOCs present at the top of the water table can volatilize and migrate as vapor through the unsaturated zone into indoor air if buildings overlie or are near the groundwater with the dissolved VOCs. VOCs in residual source material in the unsaturated zone also can volatilize and migrate towards buildings. This would be expected to be most significant in close proximity to the residual source area. Subsequent migration into indoor air is less likely to occur if the current or potential future buildings are located away from the residual VOC source area. Whether arising from groundwater or residual source material in soil, the concentration of VOCs in soil vapor decreases as it migrates and can be further diluted if it enters a building, due to the building's ventilation.

The Facility is currently occupied and is zoned for industrial uses according to the Montgomery County Property Records. For the purposes of this RAP, non-residential use and structures are used for present and future scenarios.

Therefore, receptors potentially exposed to VOCs through the VI pathway, if complete, are workers in the occupied on-site buildings.

3.4 Applicable Standards

As required in the Settlement Agreement, a screening level for TCE of 29 µg/m³ will be utilized for the six sub-slab soil gas samples in the southern (i.e., rear) one-third of the Facility.

4. FIELD SAMPLING PLAN (FSP)

The scope of work presented in this RAP includes a building survey and collection of six sub-slab soil gas samples within the Facility to measure concentrations of VOCs. The proposed sub-slab soil gas sampling locations were selected to assess the potential for a VI pathway to building receptors. The proposed locations of the six sub-slab soils gas sampling points within the southern third of the Facility are shown on Figure 4.

If any one of the six sub-slab soil gas samples exceed the applicable screening level, than either: (1) a Facility-wide sub-slab soil gas and indoor air sampling event will be completed, or (2) preemptive mitigation will be undertaken with USEPA oversight and approval.

The tasks outlined in this RAP will be accomplished by the procedures and methods described in this section, which are consistent with those described in the USEPA's November 2002 *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)* (VI Guidance; USEPA, 2002a), detailed in the Quality Assurance Project Plan (QAPP) Addendum provided in Appendix A. The field procedures will also be completed in accordance with the site-specific Health and Safety Plan (HASP) Amendment discussed in Section 7, with a copy of the HASP Amendment provided in Appendix B.

4.1 Pre-Sampling Communication

The scope of work outlined below will be discussed between the Respondents and USEPA. The approach and methodology will be approved by the USEPA prior to implementation of the sub-slab soil gas sampling activities.

Geosyntec will work directly with the Facility owner to schedule the sampling event. Given the type of operations at the Facility, products containing VOCs cannot be removed from the building; however, Geosyntec will request that removal of movable VOC sources from the immediate area of the sub-slab soil gas sampling be moved. If these cannot be removed, than a list of the VOCs present within the structure during the period of sampling will be requested.

4.2 Building Survey

Prior to the collection of VI investigation samples, a building survey will be completed with on-Site personnel. The purpose of the building survey is as follows:

- identify subsurface building utilities that may interfere with sub-slab sample point installation;
- inventory potential background sources of COCs and screen them with a photoionization detector (PID), able to detect total VOCs at part-per-million (ppm) levels;
- visually assess if potential VI pathways are present in the floor (e.g., floor cracks or joints, subsurface utility foundation penetration points, floor drains, clean-outs, sumps, vaults, etc.) and screen them with a PID;
- collect information about the construction and configuration of the building, as well as the heating, ventilation and air conditioning (HVAC) system(s); and
- select and mark-out final locations for sub-slab soil gas sampling.

To the extent possible, subsurface utilities and other obstacles in the vicinity of the sub-slab sampling locations will be located prior to the installation of the temporary sub-slab sampling points (SSPs). The proposed temporary SSP locations may be changed based on findings of the subsurface utility mark-out and/or known building utilities. An example of the Building Information Log form is provided in Appendix C.

4.3 Temporary Sub-Slab Gas Probe Installation and Testing

Temporary SSPs will be installed through the floor slab at each sampling location as shown on Figure 4. Sampling personnel must avoid activities immediately before and during the sampling that may contaminate the sample (e.g., using markers, fueling vehicles, etc.).

Weather information (e.g., temperature, barometric pressure, rainfall, wind speed, and wind direction) should be recorded at the beginning of the sampling event. Record substantial changes to these conditions that may have occurred over the past 24 to 48 hours and that do occur during the course of sampling. The information may be measured with on-site equipment or obtained from a reliable source of local measurements (e.g., a local airport).

Temporary SSPs will be inserted and set into ½-inch (in) diameter holes drilled through the concrete slab using a heavy-duty electrical hammer-drill. Once a hole has been drilled, a temporary SSP insert, which consists of a brass pipe fitted with a

compression-fit stainless steel ball valve, will be installed into the hole and then promptly sealed with modeling clay to minimize potential air flow into or out of the drilled hole.

After installation of the temporary SSPs, a vacuum gauge will be used to measure the sub-slab-to-indoor-air pressure differential. Then, soil gas will be purged from each probe to remove atmospheric air which may have been entrained during probe installation. During probe development, the flow rate and vacuum will be measured, and these data will be used to calculate the permeability of the geologic materials surrounding the probe tip to gases to confirm that it is sufficient to allow for active soil gas sampling without the need for excessive applied vacuum. A figure depicting the probe development and permeability testing apparatus is included in Appendix D.

Vacuum “shut-in” tests will be conducted to assess whether there are leaks in the aboveground fittings of the sample plumbing prior to field screening and sample collection. A vacuum of approximately 30 inches of water column (in-H₂O) will be applied to the lines, and then valves at both ends will be shut to seal in the vacuum. The vacuum will be monitored for at least 1 minute and if visible change in vacuum is observed the fittings will be tightened and the tests repeated.

Helium will be used as a tracer gas during the leak checks to provide additional assurance that atmospheric air is not entering the soil gas sample through the annular seal around the temporary SSPs or through aboveground fittings. During the purging and field screening processes, a shroud is placed over each temporary SSP and helium gas is delivered into the shroud. A “lung box” is then used to purge the temporary SSPs by drawing soil gas through them into 1-L Tedlar[™] bags. The concentrations of helium in the shroud and in the purged volumes are measured using a helium detector. Helium concentrations in the purged volumes less than 5% of the shroud concentration indicate that there are no significant leaks in the sample plumbing.

The purged volumes will also be field screened for oxygen (O₂), carbon dioxide (CO₂), and methane (CH₄) using a landfill gas meter, and total VOCs using a PID. The field screening will be conducted to characterize soil gas prior to the collection of samples for laboratory analysis. Soil gas samples will be collected for laboratory analysis after the O₂, CO₂, CH₄ and VOC field meter readings stabilize.

4.4 Soil Gas Sample Collection

The sub-slab soil gas samples will be collected in batch-certified 1-L Summa™ canisters equipped with 5-μm filters and laboratory calibrated and certified 200 milliliter per minute (mL/min) flow controllers. In addition, one blind field duplicate sample will be collected. The initial vacuum in the canisters will be measured and recorded prior to use to document that the canisters did not leak during shipment from the laboratory. Following the completion of sampling, the final vacuum will also be measured and recorded on both the field forms and the laboratory identification label. The canisters will then be shipped to the laboratory at ambient temperature under chain-of-custody control. Upon receipt of the canisters at the laboratory, the vacuum will be measured again by the laboratory to ensure that the canister did not leak during shipment. A figure depicting the field screening and sample collection apparatus is included in Appendix D.

4.5 Soil Gas Point Abandonment

At the completion of sub-slab soil gas sampling, each temporary SSP will be removed from the ground. Immediately thereafter, hydrating cement will be used to backfill the hole and reseal the slab, and dust or excess cement that is generated will be wiped away.

4.6 Analytical Methods

All sub-slab soil gas samples will be analyzed by Lancaster Laboratories, Inc., Lancaster, Pennsylvania (Lancaster Laboratories). Samples will be analyzed for the four COCs listed on Table 1 by USEPA Method TO-15. Further details regarding the analytical methods, sample containers, and quality assurance/quality control (QA/QC) are discussed in Section 5, with further detail within the QAPP Addendum (see Appendix A).

5. QUALITY ASSURANCE AND QUALITY CONTROL

A summary of the quality assurance/quality control (QA/QC) procedures, routines, and specifications for activities to be completed during the RAP field activities is summarized herein. Details of the QA/QC program are provided in the attached QAPP Addendum included in Appendix A. The QAPP Addendum has been prepared to address the QA/QC requirements for a VI Assessment, and is an addendum to the QAPP dated June 2013 (Geosyntec, 2013). The QAPP Addendum was prepared following USEPA *Guidance for Quality Assurance Project Plans* (USEPA, 2002b), and USEPA *Requirements for Quality Assurance Project Plans* (USEPA, 2001). The QAPP Addendum addresses sampling procedures, personnel qualifications and data reduction, validation, and reporting. The QA/QC procedures and SOPs for laboratories used during the RAP field activities are included in the QAPP Addendum including their qualifications within Appendix A.

5.1 Sample Containers and Preservation

Lancaster Laboratories will supply all sampling collection containers. The sub-slab soil gas samples will be collected in batch-certified 1-L Summa™ canisters equipped with 5-µm filters and laboratory calibrated and certified 200 milliliter per minute (mL/min) flow controllers.

5.2 Field Quality Control Samples

A Field duplicate sample will be collected and labeled with a fictitious identification for location and time, and submitted to the laboratory as a regular sample. The actual identification of the field duplicate sample will be recorded in the field logbook. The field duplicate will be analyzed for VOC parameters.

Field duplicate samples are independent samples collected in such a manner that they are equally representative of the sampling point and parameters of interest at a given point in space and time. Field duplicate samples provide precision information of homogeneity, sample collection, handling, shipping, and storage of samples.

Field duplicates will be collected at the same time and location as the original sample is collected. Field duplicate samples will be analyzed with the original field samples for VOC parameters. One duplicate sample will be collected.

5.3 Chain of Custody Procedures

Sample identification of chain of custody shall be maintained for the Site through chain of custody procedures as described in the QAPP:

- Samples labels, which prevent misidentification of samples,
- Custody seals to preserve the integrity of the sample from the time it is collected until it is opened in the laboratory;
- Field logbooks and forms to record information about the Site investigation and sample collection; and
- Chain of custody records to establish the documentation necessary to trace sample possession from the time of collection to laboratory analysis.

5.4 Data Validation

Analytical data reported by the laboratory will be validated according to procedures in the QAPP and QAPP Addendum (Geosyntec, 2013, and Appendix A, respectively). The data review will include: field documentation, chain-of-custody, holding times, dilution factors, surrogate recoveries, analytical quantitation limits (QLs), and laboratory QC samples. A table summarizing the quality control results, including revisions or qualifiers deemed necessary, will be generated. Based on the data validation and review process described, a determination on the usability of the data will be made. Validated data will be summarized in a tabular format and the results of the data validation will be summarized and submitted to USEPA in the following monthly progress report. Electronic tables of validated data also will be included with the report deliverable.

6. REPORTING

The reporting as part of the RAP is the monthly progress reports (MPRs) as required by the Settlement Agreement, and the reporting of the sub-slab soil gas sampling results and recommendations for next steps.

6.1 Monthly Progress Reports

Per the Settlement Agreement, Geosyntec will submit MPRs beginning on or before the tenth day of the month after receipt of EPA approval of the RAP. The Settlement Agreement notes that the MPRs are due every thirty (30) calendar days thereafter; however, we request that the tenth day of each month be set as the due date to simplify preparation. As required by the Settlement Agreement, these MPRs will include:

- A description of the response action completed and the actions that have been taken toward achieving compliance with the Settlement Agreement;
- A description of all data anticipated and activities scheduled for the next reporting period;
- A description of any problems encountered or anticipated;
- Any actions taken to prevent or mitigate such problems;
- A schedule for completion of such actions;
- Copies of all analytical data received during the reporting period; and
- All modifications to the response action, RAP, and schedule made in accordance with Sections XIV and XIX of the Settlement Agreement during the reporting period.

6.2 Final Report

Upon review of the results of the six sub-slab soil gas samples, a determination will be made whether (1) the screening level for TCE has been exceeded; (2) additional sampling will be performed; or (3) preemptive mitigation will be pursued. If additional sampling or preemptive mitigation will be performed, a RAP Supplement will be submitted to USEPA on an expeditious basis pursuant to a schedule to be agreed upon with USEPA.

Per Section VIII Paragraph 53 of the Settlement Agreement, if the screening level for TCE has not been exceeded a Final Report will be submitted to USEPA within twenty-eight (28) calendar days of receipt of analytical results. The Final Report will detail the work undertaken to implement the RAP and the requirements within Section VIII Paragraph 43 of the Settlement Agreement. The Final Report shall summarize the methodologies used, the data collected, and any problems encountered. The data shall be depicted in tabular summary format and in a graphical format that identifies the sample locations at the Site. If the sub-slab soil gas analytical results are above the screening threshold of $29 \mu\text{g}/\text{m}^3$ for TCE, a RAP Supplement will be submitted, as noted above, and the Final Report will not be submitted until the completion of the tasks noted in the RAP Supplement.

7. HEALTH AND SAFETY

An amended version of the site-specific HASP which includes the VI Task Hazard Analysis (THA) is provided in Appendix B (HASP Amendment). The HASP Amendment and THA were prepared to establish the procedures, personnel responsibilities, and training necessary to protect the health and safety of field personnel during the completion of field activities during execution of the RAP. The HASP Amendment and THA were prepared per Occupational Safety and Health Administration (OSHA) 29 CFR 1910.120 requirements providing procedures and plans for routine field activities for unexpected Site emergencies. Geosyntec field personnel will have 40 hour OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) Training and be current with annual OSHA HAZWOPER refresher training and medical monitoring.

8. SCHEDULE

Implementation of this work will commence upon USEPA approval of this RAP. The building survey will occur during the first Site visit within 10 business days of USEPA approval of this RAP. Once dates for sample collection are coordinated with Constantia, Geosyntec will install and sample the temporary SSPs. The sample collection is anticipated to be completed within 15 business days of USEPA approval of this RAP. Field staff will document field activities (e.g., pre-sampling Site reconnaissance and sampling logs). Geosyntec anticipates receiving raw data from the laboratory approximately three weeks (i.e., 15 business days) after submittal to the laboratory and data validation is anticipated to be completed approximately 3 weeks (i.e., 15 business days) after receipt of final results from the laboratory.

Per Section VIII Paragraph 53 of the Settlement Agreement, if the screening level for TCE has not been exceeded a Final Report will be submitted to USEPA within twenty-eight (28) calendar days of receipt of analytical results. If the sub-slab soil gas analytical results are above the screening threshold of 29 $\mu\text{g}/\text{m}^3$ for TCE, a RAP Supplement will be submitted, as noted below, and the Final Report will not be submitted until the completion of the tasks noted in the RAP Supplement.

Should a Facility-wide sub-slab soil gas and indoor air sampling event or preemptive mitigation be warranted, Geosyntec will discuss the timing with USEPA in a technical meeting prior to implementation. If either is deemed necessary, a RAP Supplement will be submitted providing additional necessary details. The technical meeting with USEPA is anticipated to occur within twenty-eight (28) calendar days of receipt of analytical results, and the RAP Supplement is anticipated to be submitted within 10 business days following the technical meeting with USEPA.

If the outcome of the technical meeting with USEPA determines more sampling is appropriate, following submittal of the RAP Supplement, the sampling of additional sub-slab soil gas and collocated indoor air samples at 8 locations is anticipated to occur within 15 business days of USEPA approval of the RAP Supplement. Geosyntec anticipates receiving raw data from the laboratory approximately three weeks (i.e., 15 business days) after submittal to the laboratory and data validation is anticipated to be completed approximately 3 weeks (i.e., 15 business days) after receipt of final results from the laboratory. Per Section VIII Paragraph 53 of the Settlement Agreement, a Final Report will be submitted to USEPA within twenty-eight (28) calendar days of receipt of analytical results.

If the outcome of the technical meeting with USEPA determines preemptive mitigation is appropriate, the RAP Supplement will lay out the steps of the preemptive mitigation system remedial design (RD). The Preliminary (30%) RD of the preemptive mitigation system will be submitted within 90 days of USEPA approval of the RAP Supplement. The Pre-Final (90%) RD of the preemptive mitigation system will be submitted within 90 days of USEPA approval to the 30% RD. Implementation scheduling of the preemptive mitigation system will require Constantia concurrence and the implementation schedule will be outlined within the 90% RD submittal.

9. REFERENCES

- Geosyntec, 2013. Preliminary (30%) Design Submittal / Pre-Design Investigation Work Plan. Geosyntec, 14 June 2013.
- Geosyntec, 2014. Intermediate (60%) Design Submittal / Pre-Design Investigation Report and Preliminary Remedial Design. Geosyntec, 17 February 2014.
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- USEPA, 2001. EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5. EPA-240-B-01-003. USEPA, March 2001.
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- USEPA, 2002b. EPA Guidance for Quality Assurance Project Plans, EPA QA/G-5. EPA-240-R-02-009. USEPA, December 2002.
- USEPA, 2011. Record of Decision for Interim Response Action North Penn Area 5 Superfund Site Operable Unit 2. USEPA, 7 September 2011.
- USEPA, 2014. Administrative Settlement and Order of Consent for Removal Response Action, Docket No. CERC-03-2014-0060AC, Stabilus, Inc. and Constantia Colmar, Inc. USEPA, 14 March 2014.

TABLES

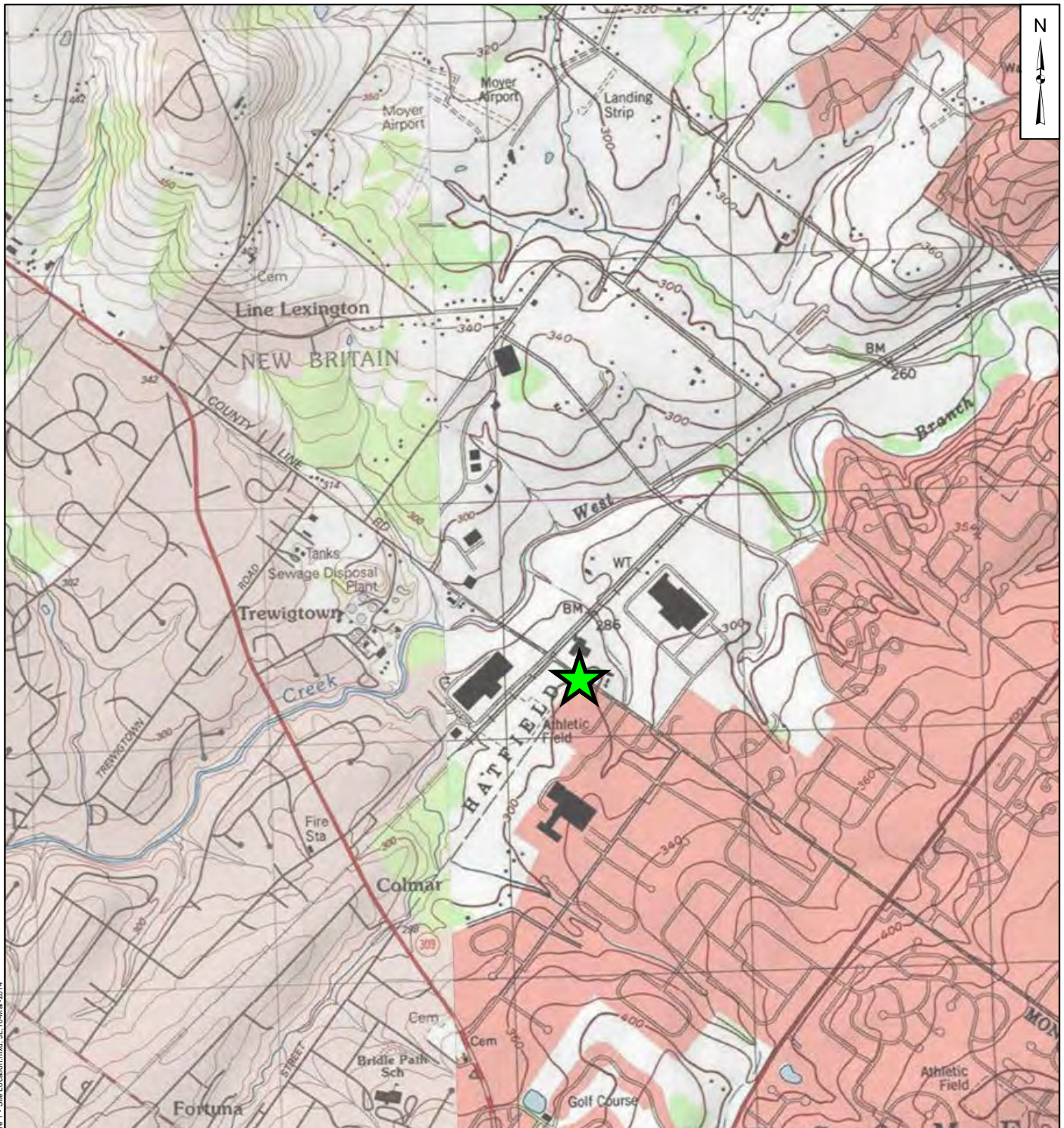
TABLE 1
Comprehensive List of Contaminants of Concern
Operable Unit 2 North Penn Area 5 Superfund Site
Colmar, Pennsylvania

Chemicals of Concern ¹	Laboratory Detection Limit (µg/m ³)	Laboratory Limit of Quantitation (µg/m ³)	Industrial Inhalation Cancer RSL at 1E-06 (µg/m ³)	Industrial Inhalation Non-Cancer RSL at HI = 0.1 (µg/m ³)
1,1,-Dichloroethene	0.806	4.030	NA	88
1,2-Dichloroethane	0.823	4.110	0.47	3.1
Tetrachloroethene (PCE)	1.380	3.450	47	18
Trichloroethene (TCE)	1.090	2.730	3.0	0.88

Notes:

1. List of chemicals of concern were obtained from Table 1 within the USEPA's 2011 Record of Decision for Interim Response Action at the North Penn Area 5 Superfund Site Operable Unit 2.
2. Units are presented in parts per billion volume (ppbv) or micrograms per cubic meter (µg/m³).
3. Laboratory detection limits and reporting limits provided by Lancaster Laboratories, Inc. of Lancaster, Pennsylvania.
4. Risk Screening Levels (RSLs) as provided by USEPA's Mid Atlantic Region Industrial Air Supporting Table (TR=1E-6, HQ=0.1), November 2013.

FIGURES



2,400 1,200 0 2,400 Feet



Site Location Map

RESPONSE ACTION PLAN FOR VAPOR INTRUSION ASSESSMENT
 Operable Unit 2 North Penn Area 5 Superfund Site
 Administrative Settlement and Order on Consent for Removal Response Action
 Docket No. CERC-03-2014-0060AC

Notes

Base Map: USGS Doylestown(1999) and Telford (1997)
 7.5 Minute Quadrangles.

Geosyntec
 consultants

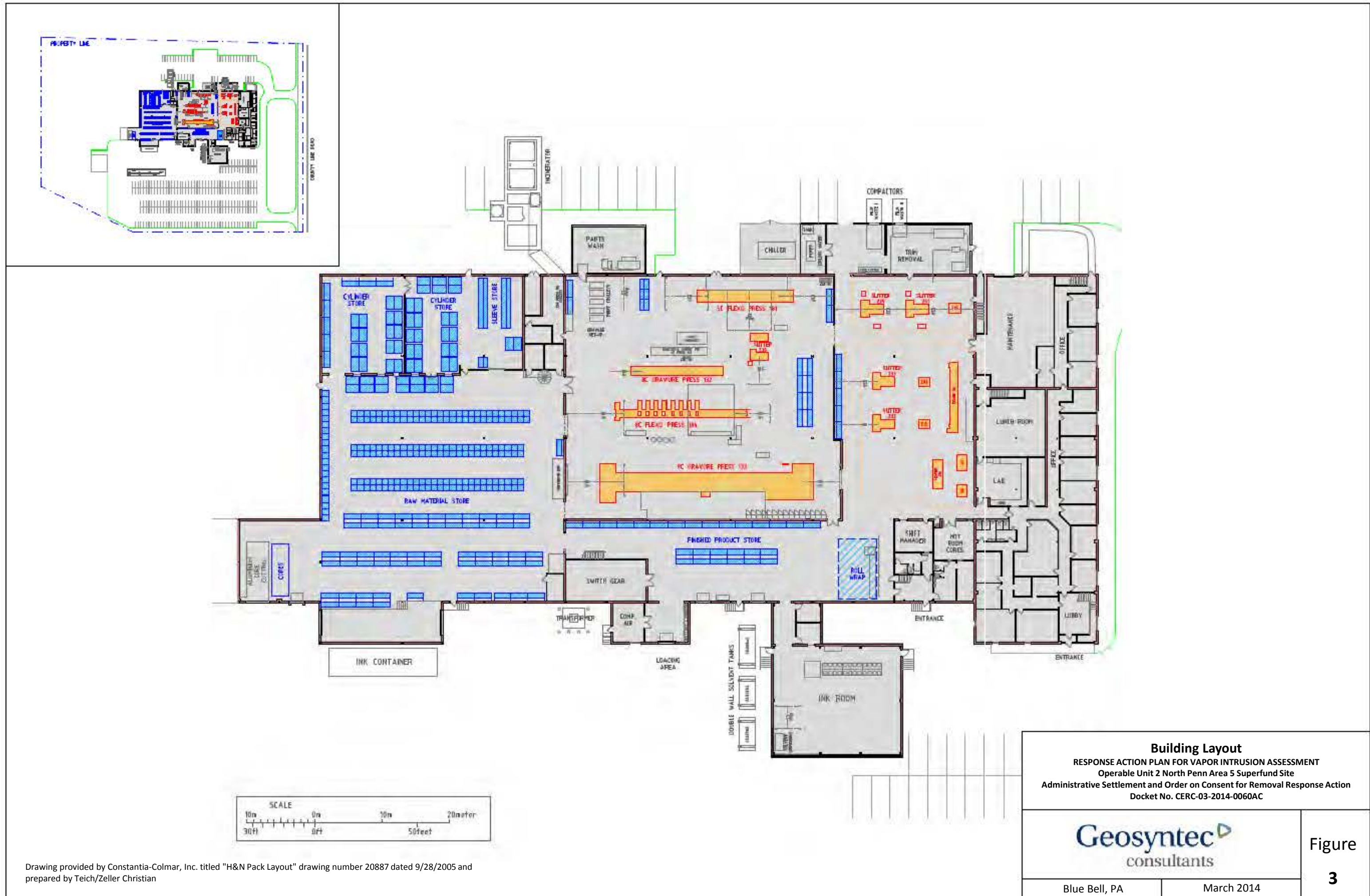
Blue Bell, PA

March 2014

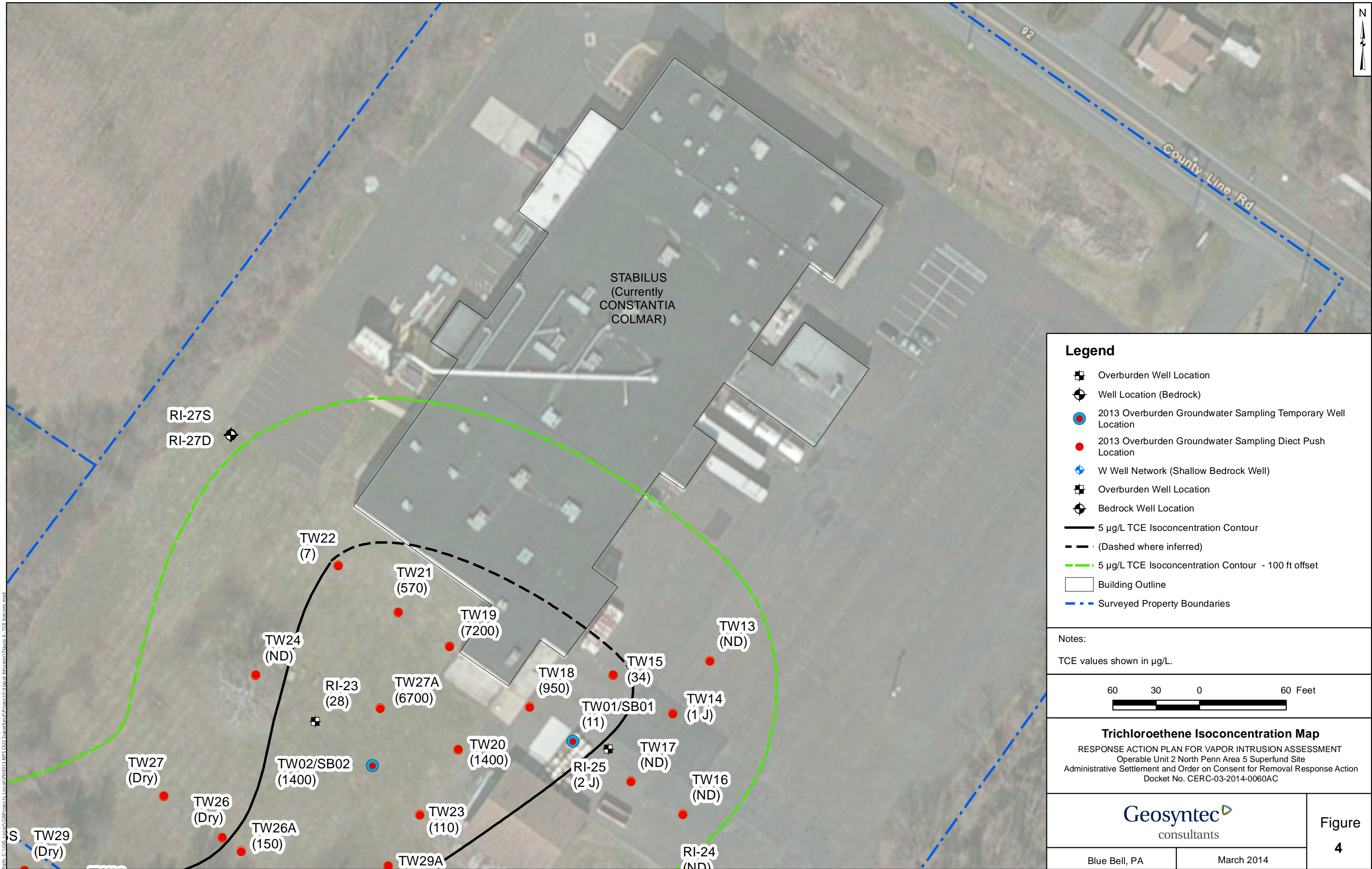
Figure

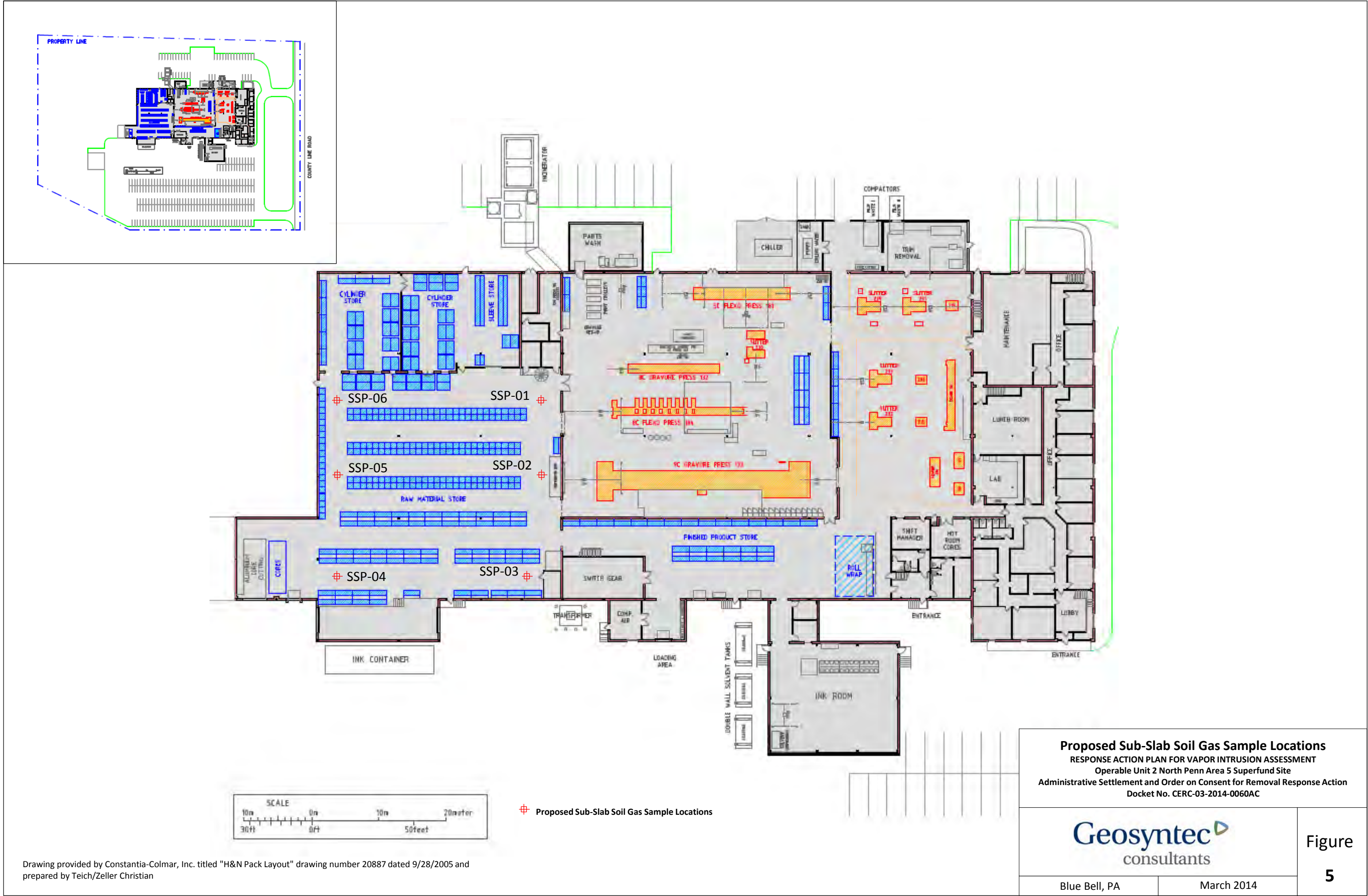
1





Drawing provided by Constantia-Colmar, Inc. titled "H&N Pack Layout" drawing number 20887 dated 9/28/2005 and prepared by Teich/Zeller Christian





APPENDIX A
Quality Assurance Project Plan (QAPP)
Addendum

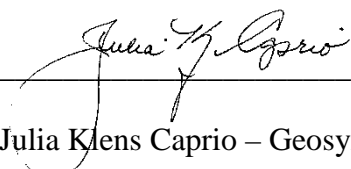
USEPA Region 3
1650 Arch Street
Philadelphia, PA 19103


**QUALITY ASSURANCE PROJECT PLAN (QAPP)
ADDENDUM 1 – VAPOR INTRUSION ASSESSMENT**

Operable Unit 2 North Penn Area 5 Superfund Site

**Administrative Settlement and Order of Consent for Removal Response Action
Docket No. CERC-03-2014-0060AC**

Geosyntec Consultants, Inc.
April 2014

Prepared by:  Date: 2 April 2014
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engineers | scientists | innovators

QUALITY ASSURANCE PROJECT PLAN ADDENDUM 1 – VAPOR INTRUSION ASSESSMENT

**Operable Unit 2 North Penn Area 5 Superfund Site
Administrative Settlement and Order of Consent
for Removal Response Action
Docket No. CERC-03-2014-0060AC**

Prepared for:

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Project Number PH0055

April 2014

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LIST OF ATTACHMENTS

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LIST OF ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirements
ASAOC	Administrative Settlement Agreement and Order on Consent
CERCLA	Comprehensive Environmental Response, Compensation, And Liability Act
CFR	Code Of Federal Regulation
COC	Compounds of Concern
CSM	Conceptual Site Model
DQI	Data Quality Indicators
DQO	Data Quality Objectives
EDD	Electronic Data Deliverable
EISB	Enhanced In Situ Bioremediation
FSP	Field Sampling Plan
GC/MS	Gas Chromatography/Mass Spectrometer
GIS	Geographic Information System
HASP	Health and Safety Plan
HDPE	High-Density Polyethylene
HI	Hazard Index
ID	Identification
LCS	Laboratory Control Sample
LPM	Laboratory Project Manager
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
OU2	Operable Unit 2
PDEP	Pennsylvania Department of Environmental Protection
%R	Percent Recovery
PARCCS	Precision, Accuracy, Representativeness, Completeness, Comparability, And Sensitivity
PDI	Pre-Design Investigation
PRG	Preliminary Remediation Goal
QA	Quality Assurance

LIST OF ACRONYMS (continued)

QAPP	Quality Assurance Project Plan
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
RPD	Relative Percent Difference
RPM	Remedial Project Manager
SOP	Standard Operating Procedure
UAO	Unilateral Administrative Order
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

1. INTRODUCTION

This Quality Assurance Project Plan Addendum 1 (QAPP Addendum) supplements the United States Environmental Protection Agency (USEPA) Region 3 approved Operable Unit 2 North Penn Area 5 Superfund Site Quality Assurance Project Plan (QAPP) that was submitted as part of the Preliminary (30%) Design Submittal / Pre-Design Investigation Work Plan dated 14 June 2013 (Geosyntec, 2013) as required under the Unilateral Administrative Order (UAO) Docket No. CERCLA-03-2012-0205DC (USEPA, 2012). This QAPP Addendum was prepared in accordance with the Administrative Settlement and Order of Consent for Removal Response Action Docket No. CERC-03-2014-0060AC dated 14 March 2014 (“Settlement Agreement”; USEPA, 2014) between Stabilus and Constantia (collectively referred to as “the Respondents”) and the USEPA.

This QAPP Addendum is a required component of the Response Action Plan (RAP) prepared by Geosyntec Consultants, Inc. (Geosyntec) on behalf of Stabilus, Inc. (Stabilus) to document methods and procedures for a vapor intrusion (VI) assessment to be performed at the Constantia-Colmar, Inc. facility building located at 92 County Line Road in Colmar, Pennsylvania (“Facility”). Constantia is presently engaged in manufacturing operations at the Facility, which is located within Operable Unit 2 (OU2) of the North Penn Area 5 Superfund Site in Hatfield and New Britain Townships, Montgomery and Bucks Counties, Pennsylvania (referred herein as the “Site” or “NP5”; see Figures 1 and 2 of the RAP).

1.1 Objectives

This QAPP Addendum documents the quality assurance and quality control activities pertaining to the tasks and activities outlined within the RAP. The objectives of the QAPP are to ensure the collection of quality environmental data to support decisions regarding the management of the VI pathway.

1.2 Document Overview

This QAPP Addendum complies with the QAPP as well as the following USEPA guidance documents:

- EPA Requirements of Quality Assurance Project Plans (EPA QA/R-5), EPA/240/B-01/003 (USEPA, 2006);
- Guidance for Quality Assurance Project Plans (EPA QA/G-5), EPA/240/R-02/009 (USEPA, 2002);
- Guidance on Systematic Planning Using the Data Quality Objectives Process (EPA QA/G-4), EPA/240/B-06/00 (USEPA, 2006);
- USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, USEPA-540-R-08-01 (USEPA, 2008)
- USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, OSWER 9240.1-51, EPA 540-R-10-011 (USEPA, 2010);
- Region III Innovative Approaches to Data Validation, (USEPA, 1994b);
- Modifications to the National Functional Guidelines for Organic Data Review (USEPA, 1994a);
- Modifications to the National Functional Guidelines for Inorganic Data Review (USEPA, 1993); and
- EPA NEIC Policies and Procedures Manual, EPA 330/978-001-R (USEPA, 1986).

2. PURPOSE AND SCOPE

This QAPP Addendum describes field activities and procedures for investigating the presence of compounds of concern (COCs) in the vadose zone and assessing the potential for VI risk at the Site. Specific activities not covered in the original QAPP and included herein are:

- Initiation of pre-sampling communication with the USEPA and the Facility operator;
- Performance of a building survey to document building conditions and completion of an inventory of chemical products used within the Facility;
- Collection of six (6) sub-slab soil gas samples within the southern one-third of the Facility as required by the Settlement Agreement;
- Preparation of monthly progress summary reports; and
- Based on the results of the sub-slab soil gas sampling, prepare either a Final Report or a Supplement to the RAP for additional sampling or preemptive mitigation.

2.1 Problem Definition/Background

A summary of the Site location is presented below.

2.1.1 Site Location

The Facility is located at 92 County Line Road in Colmar, Pennsylvania, which is within the NP5 Site. NP5 is located within Hatfield and New Britain Townships, in Montgomery and Bucks Counties, Pennsylvania (Figure 1 of the RAP). NP5 encompasses an area of approximately five square-miles that is generally bounded by Richardson Road to the southeast, Bethlehem Pike (Route 309) to the west, Trewigtown Road to the northwest and Schoolhouse Road to the east (Figure 2 of the RAP). For NP5, three primary areas of groundwater contamination were identified and defined as separate and distinct operable units (OUs). The Facility is located within OU2 of the NP5 Site. A depiction of the Facility building layout is provided on Figure 3 of the

RAP.

This QAPP Addendum was developed to support the assessment of the potential for VOCs that have been historically detected in the OU2 overburden groundwater aquifer proximal to the Facility to intrude into the Facility.

2.1.2 Problem Summary

The conceptual site model (CSM) was refined as presented in the RAP to consider potential vapor migration exposure pathways that may exist or could reasonably be expected to exist in the future in accordance with USEPA guidance.

2.2 Project Organization

The structure of the project organization remains essentially the same as in the QAPP. As shown in **Figure 1**, the project staffing plan has been updated to reflect changes and additions in the Geosyntec staff assuming roles in this project, and changes in subcontracted support. The same laboratory, Lancaster Laboratories, Inc. (Lancaster) of Lancaster, PA will be used for vapor sample analysis.

2.3 Special Training

All field activities will be performed by individuals with appropriate training and experience in accordance with Section 2.5 of the QAPP (Geosyntec, 2013).

2.4 Project/Task Description and Schedule

The approximate project schedule is discussed in Section 8 of the RAP.

3. DATA QUALITY OBJECTIVES AND CRITERIA

The data quality objective (DQO) process is described in Section 2.4.2 of the QAPP (Geosyntec, 2013). This section of the QAPP Addendum describes the outcome of the DQO process for data collection activities to be conducted as part of the VI assessment at the Site.

3.1 State the Problem

In the course of completion of the pre-design investigation (PDI) activities as part of the RD, TCE was observed within the OU2 overburden groundwater aquifer near the Facility. USEPA issued the Settlement Agreement on 14 March 2014 to the Respondents in response to the observed levels of TCE near the Facility for completion of a VI investigation to assess the VI pathway.

3.2 Identify the Goals of the Study

The goal of the study is to determine if there is a VI pathway into the Facility.

3.3 Identify the Information Inputs

- Perform a building survey to document building conditions and completion of an inventory of chemical products used within the Facility.
- Collect six (6) sub-slab soil gas samples within southern one-third of the Facility as required by the Settlement Agreement.

3.4 Develop the Site Boundaries

The Site boundaries are similar to those described in section 2.1.1. Specifically, the VI assessment will be completed at the Facility.

3.5 Develop the Analytic Approach

As presented in the Interim Record of Decision (ROD; USEPA, 2011), a comprehensive list of COCs for OU2 at the Site is summarized on Table 1 of the RAP. Included on the table are the detection limits (DLs) for each contaminant, the reporting limits (RLs) for USEPA Method TO-15, and appropriate Inhalation Regional Screening Levels (RSLs)

for each compound of concern assuming an Industrial Inhalation Cancer Risk Screening Level RSLs of 1E-06 and the Industrial Inhalation Non-Cancer values at a hazardous index (HI) of 0.1. Per the Settlement Agreement, if the sub-slab soil gas concentration for TCE is above $29 \mu\text{g}/\text{m}^3$, then prepare either a Final Report or a Supplement to the RAP for additional sampling or preemptive mitigation.

3.6 Specify Performance Criteria

For the decision problems, performance or acceptance criteria will be addressed without the need for statistical test designs as follows:

- a screening level for TCE of $29 \mu\text{g}/\text{m}^3$ will be utilized for the six sub-slab soil gas samples in the southern (i.e., rear) one-third of the Facility.
- The data are required to be valid in accordance with USEPA Method TO-15 and ASTM D 1946.

3.7 Develop the Plan for Obtaining Data

Details pertaining to the sample design and procedures are contained in the RAP. The sampling designs presented in these documents are determined on the basis of the DQO process described herein in order to meet the project objectives.

4. FIELD SAMPLING PLAN

The methods and procedures that will be implemented in support of the VI assessment activities described in this QAPP Addendum for the purpose of producing data that meet the DQOs described in Section 2 is contained in Section 4 of the RAP. Table 2 describes the calibration requirements for field instrumentation used during the VI investigation. Table 3 lists the preservation and holding time requirements.

5. ANALYTICAL METHODS

For this investigation, laboratory analysis of vapor samples will be performed by the fixed-based laboratory Lancaster. Gaseous samples collected during this investigation will be analyzed by the following method:

- VOCs by USEPA Method TO-15.

The target analytes and target analytical method quantification limits are provided in Table 4 for the sub-slab gas samples.

5.1 Project Quality Assurance/Quality Control

Sub-slab soil gas sample analysis will be performed by Lancaster which is a National Environmental Laboratory Accreditation Council (NELAC) accredited laboratory using standard methods. Summa™ canisters and flow controllers used for sub-slab soil gas sample collection will be certified as clean by the laboratory. Data will be assessed through measures of precision, accuracy, representativeness, comparability, completeness, and sensitivity (PARCCS) parameters. PARCCS are defined in Section 2.4.3 of the QAPP.

5.2. Objectives

QA/QC will be maintained through the collection of QA/QC samples (equipment blanks and duplicates) and testing during sample collection. The requirements for QA/QC samples and testing are presented in the following sections. The field quality control sample summary is included in Table 5 and the measurement performance criteria are in Table 6.

5.3 Leak Prevention and Testing

The leak prevention and testing is described in Sections 4.3 and 4.4 of the RAP. Specifically the leak prevention and testing includes the following:

- Compression fittings (e.g., Swagelok™) will be used for all fittings in the sampling train for sub-slab soil gas samples;

- Modeling clay seals will be used throughout the annulus of sub-slab soil gas points (SSPs) to minimize the potential for leaks from above the screened interval;
- Above-ground fittings for SSPs will be tested using a “shut-in” test prior to sampling; and
- Both above-ground fittings and annular seals will be tested using helium tracer testing.

5.4 Duplicate Samples

Duplicate samples will be collected with a frequency of one for every twenty (i.e., 1 per 20) investigative samples for VOC and fixed gases analyses. Duplicate samples will be collected using a “T” fitting, so both samples are collected at the same time. To the extent possible, duplicate samples will be collected strategically based on field screening readings to span the range of VOC and fixed gas concentrations. Results will enable an assessment of reproducibility of analysis for various Site conditions.

5.5 Summa Canister Vacuum Check

For Summa™ canisters, the initial vacuum will be measured with a vacuum gauge and recorded before and after use, in the field and in the laboratory, to assess potential leakage during return shipment to and from the Site. If the initial field reading indicates a difference greater than approximately one inch of mercury, the canister will not be used for sampling. If the final laboratory vacuum reading indicates a difference greater than approximately one inch of mercury, then that information will be taken into consideration during the data validation process.

5.6 Project Required Control Limits

Advisory precision and accuracy QC limits for analyses conducted by the accredited laboratory are identified in Table 4.

6. DATA MANAGEMENT, INTERPRETATION, AND REPORTING

The data reduction, validation, verification, usability and data reporting are presented in this Section.

6.1 Data Reduction, Validation, Verification, Usability

The results of the laboratory analyses will be validated (100% Stage 4 validation) within three weeks after the results from the laboratory are finalized. A report of the data validation process will be prepared and will address any deficiencies that might affect the usefulness of the data for the intended purpose.

6.2 Data Reporting

Upon completion of the above-described scope of work, Geosyntec will report the results in a VI assessment report.

7. REFERENCES

- Geosyntec, 2013. Preliminary (30%) Design Submittal / Pre-Design Investigation Work Plan. Geosyntec, 14 June 2013.
- USEPA, 1986. EPA NEIC Policies and Procedures Manual. EPA 330/978-001-R. USEPA, May 1986.
- USEPA, 1993. Modifications to the National Functional Guidelines for Inorganic Data Review. USEPA Region III, April 1993.
- USEPA, 1994a. Modifications to the National Functional Guidelines for Organic Data Review. USEPA Region III, September 1994.
- USEPA, 1994b. Region III Innovative Approaches to Data Validation. USEPA Region III, September 1994.
- USEPA, 2001. EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5. EPA-240-B-01-003. USEPA, March 2001.
- USEPA, 2002. EPA Guidance for Quality Assurance Project Plans, EPA QA/G-5. EPA-240-R-02-009. USEPA, December 2002.
- USEPA, 2006. Guidance on Systematic Planning Using the Data Quality Objectives Process (EPA QA/G-4). EPA/240/B-06/001. USEPA, February 2006.
- USEPA, 2008. USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review. EPA-540-R-08-01. USEPA, , June 2008.
- USEPA, 2010. USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review. OSWER 9240.1-51, EPA 540-R-10-011. USEPA, January 2010.
- USEPA, 2011. Record of Decision for Interim Response Action North Penn Area 5 Superfund Site Operable Unit 2. USEPA, 7 September 2011.

USEPA, 2012. Unilateral Administrative Order for Remedial Design and Remedial Action. Docket No. CERCLA-03-2012-0205DC. USEPA, 26 June 2012.

USEPA, 2014. Administrative Settlement and Order of Consent for Removal Response Action, Docket No. CERC-03-2014-0060AC, Stabilus, Inc. and Constantia Colmar, Inc. USEPA, 14 March 2014.

TABLES

TABLE 1
SAMPLING LOCATIONS/IDS, SAMPLE DEPTHS, SAMPLE ANALYSES, AND SAMPLING PROCEDURES

Quality Assurance Project Plan Addendum 1
Operable Unit 2 North Penn Area 5 Superfund Site

Sampling Location/ ID Number	Matrix	Depth ¹ (ft bgs)	Height ¹ (ft ags)	Number of Samples		Sampling Reference ²
				TO-15		
SSP01	SV	--	NA	√	1	QAPP Addendum 1, Section 3.2
SSP02	SV	--	NA	√	1	QAPP Addendum 1, Section 3.2
SSP03	SV	--	NA	√	1	QAPP Addendum 1, Section 3.2
SSP04	SV	--	NA	√	1	QAPP Addendum 1, Section 3.2
SSP05	SV	--	NA	√	1	QAPP Addendum 1, Section 3.2
SSP06	SV	--	NA	√	1	QAPP Addendum 1, Section 3.2

bgs – below ground surface

ags – above ground surface

ft – feet

SV – Soil Vapor

NA – not applicable

TABLE 2

FIELD EQUIPMENT CALIBRATION, MAINTENANCE, TESTING, AND INSPECTION

**Quality Assurance Project Plan Addendum 1
Operable Unit 2 North Penn Area 5 Superfund Site**

Field Equipment ¹	Calibration Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	Reference	Comments (Resolution)
PID	VOCs	At least twice daily	0 – 10,000 ppm	Check, investigate, correct, recalibrate, and return to manufacturer if necessary	On-site field team lead	SAP Addendum, Appendix B	For 0 – 999 ppm: 0.1 ppm; For 100 – 10,000 ppm: 1 ppm
Dielectric MGD-2002 Helium detector	Helium	At least twice daily	25 ppm – 100%				Low range: ± 25 ppm; High range: ± 0.2%
Landtec GEM500 Landfill Gas Meter or equivalent	Methane, oxygen, and carbon dioxide	At least twice daily	Methane 0-70% Carbon dioxide 0-40% Oxygen 0-25%				0.1%

Notes:

% – percentage, volume per volume
PID – photoionization detector
ppm – parts per million
RAWP – Removal Action Work Plan
SAP – Sampling and Analysis Plan
VOC – volatile organic compound

TABLE 3

ANALYTICAL METHODS, CONTAINERS, PRESERVATIVES, AND HOLDING TIMES

**Quality Assurance Project Plan Addendum 1
Operable Unit 2 North Penn Area 5 Superfund Site**

Matrix¹	Analytical Group	Analytical and Preparation Method²	Containers (number, size, type)	Preservation Requirements (chemical, temperature, etc.)	Maximum Holding Time (preparation/analysis)
SV	VOCs	USEPA TO-15	1L Summa™ canisters	None	30 days

Notes:

EPA – U.S. Environmental Protection Agency

SV – Soil Vapor

VOC – volatile organic compound

TABLE 4
ANALYTICAL REFERENCE AND CONTROL LIMITS

Quality Assurance Project Plan Addendum 1
Operable Unit 2 North Penn Area 5 Superfund Site

Matrix: Soil Vapor USEPA Method TO-15

Analytical Group: Volatiles

Concentration Level: Low

Analyte	CAS Number	Project Screening Level (µg/m ³)	Project Action Limit Reference	Laboratory Control Limits LCS (%)		RPD (%)	Laboratory-specific	
							Quantitation Limit (µg/m ³)	Detection Limit (µg/m ³)
1,1-Dichloroethene (11DCE)	75-35-4	2,900	Sub-slab to indoor air attenuation factor of 0.03 Industrial Inhalation Non-Cancer RSL at HI=0.1	70	130	30	4.0	0.9
1,2-Dichloroethane (12-DCA)	107-06-2	15.7	Sub-slab to indoor air attenuation factor of 0.03 Industrial Inhalation Cancer RSL at 1E-06	70	130	30	4.0	0.9
Tetrachloroethene (PCE)	127-18-4	600	Sub-slab to indoor air attenuation factor of 0.03 Industrial Inhalation Non-Cancer RSL at HI=0.1	70	130	30	7.0	1.0
Trichloroethene (TCE)	79-01-6	29	Settlement Agreement	70	130	30	6.0	1.0

Notes:

µg/m³ – microgram per cubic meter

LCS – Laboratory control sample

RPD – relative percent difference

NA – not applicable

RSL – risk screening level.

TABLE 5

FIELD QUALITY CONTROL SAMPLE SUMMARY

**Quality Assurance Project Plan Addendum 1
Operable Unit 2 North Penn Area 5 Superfund Site**

Matrix	Analytical Group	Analytical and Preparation Reference	# of Primary Sampling Locations	# of Field Duplicates	# of MS/MSDs	# of Field (Source) Blanks	# of Equipment Blanks	# of Trip Blanks	Total # of Samples to Lab
OPERABLE UNIT 2									
SV	USEPA TO-15	QAPP Addendum Section 5.2	6	1	NA	NA	NA	0	7

Notes:

USEPA – U.S. Environmental Protection Agency
SV- soil vapor
MS/MSD – matrix spike/matrix spike duplicate
NA – not applicable

TABLE 6

MEASUREMENT PERFORMANCE CRITERIA TABLE – FIELD QC SAMPLES

**Quality Assurance Project Plan Addendum 1
Operable Unit 2 North Penn Area 5 Superfund Site**

QC Sample (SV)	Analytical Group	Frequency	Data Quality Indicators	Measurement Performance Criteria	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Field Duplicate	VOCs TO-15	One per 20 samples	Precision - overall	$RPD \leq 30\%$ when analytes detected in both the original and field duplicate samples	S&A

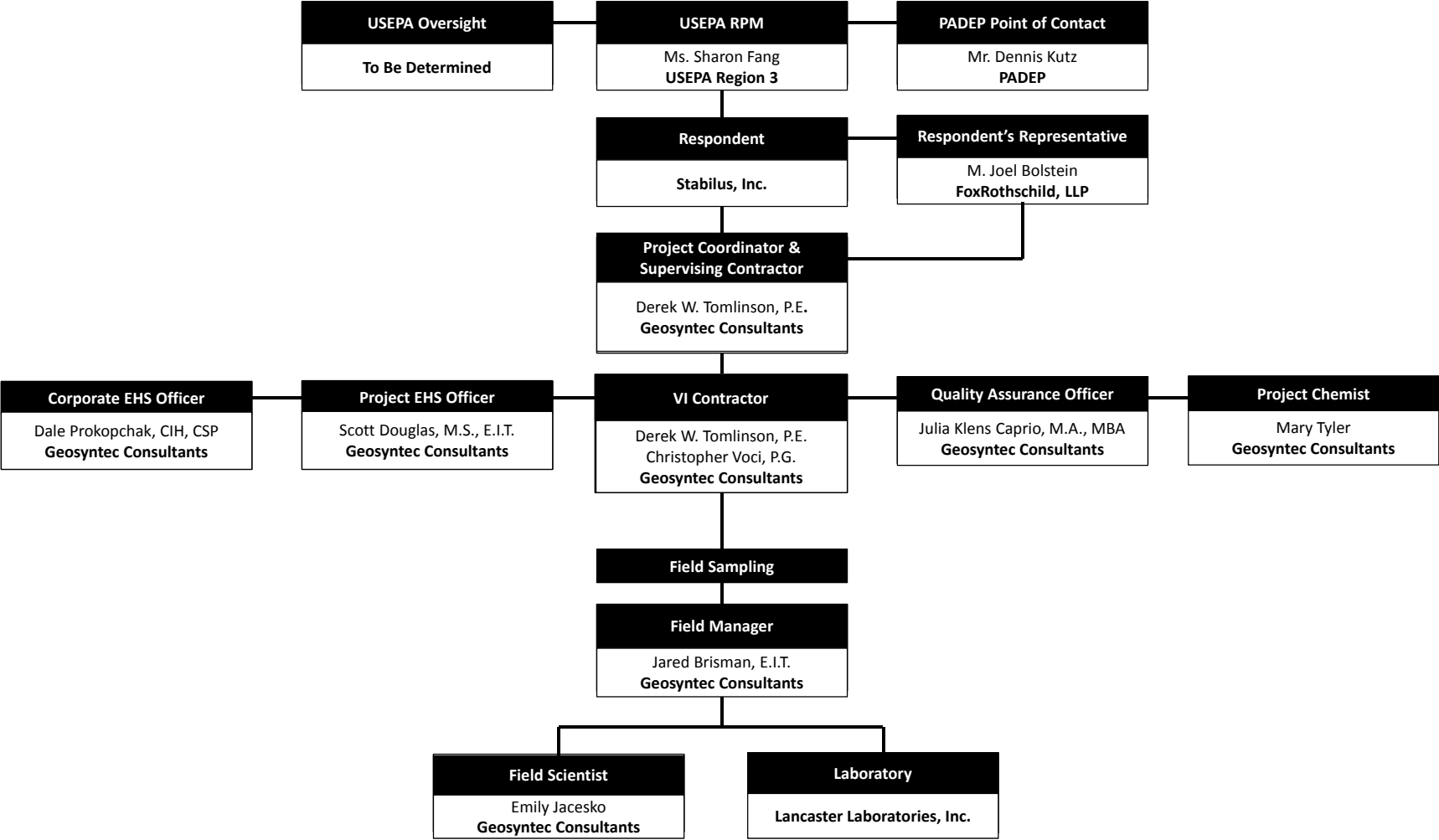
Notes:

SV- soil vapor

VOC – volatile organic compound

FIGURES


FIGURE 1: QAPP Addendum Project Team Organization
Operable Unit 2 North Penn Area 5 Superfund Site



ATTACHMENT A

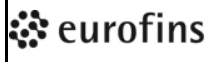
SUPPLEMENTAL LABORATORY INFORMATION

LABORATORY STANDARD OPERATING PROCEDURES AND QUALITY INFORMATION

 Lancaster Laboratories	Document Title: The Automated Determination of Volatile Organic Compounds in Air Collected in Specially Treated Canisters or Tedlar Bags Using Cryogenic Preconcentration and Gas Chromatography with Mass Selective Detection Using EPA Method TO-14 or TO-15	Eurofins Document Reference: 1-P-QM-WI-9015155
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Eurofins Document Reference	1-P-QM-WI-9015155	Revision	11
Effective Date	Apr 11, 2013	Status	Effective
Historical/Local Document Number	Analysis DOD - 5265, 5298, 0015, 0037, 7199, 7869		
Local Document Level	Level 3		
Local Document Type	TEST - Testing Document		
Local Document Category	ANALYSIS-ES - Analysis-Environmental Science		

Prepared by	Michele Smith
Reviewed and Approved by	Charles Neslund;Review;Thursday, April 11, 2013 10:08:25 AM EDT Kathryn Brungard;Approval;Thursday, April 11, 2013 10:16:49 AM EDT

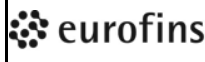
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Revision Log:

Revision: 11		Effective Date:	This version
Section	Justification	Changes	
Revision Log	Formatting requirement per 1-P-QM-QMA-9017356	Removed revision logs up to the previous version	
Throughout Document	Reflects re-identification of documents in EtQ	Replaced all prior Level 1, 2, 3, and 4 document numbers (analyses excluded) with EDR numbers	
Recertification of Reagents and Standards	Document the process for recertification of standards	New section. added to detail the process to recertify the reagents and standards used in this method	

Revision: 10		Effective Date:	Sept 19, 2012
Section	Justification	Changes	
Revision Log	Formatting requirement per LOM-SOP-LAB-201	Removed revision logs up to the previous version	
Procedure A.	Clarification	Changed 6 th level calibration from 100 to 70	
Procedure D.	Clarification	100 to 70	
Table II	Reflect current procedure	Added analytes	
Table III	Reflect current procedure	Added analytes	
Table IV	Reflect current procedure	Added analytes	

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Reference:

1. EPA Method TO-15, *Methods for the Determination of Toxic Organic Compounds in Air*, 1999.
2. EPA Method TO-14A, *Determination of Volatile Organic Compounds in Ambient Air with Analysis by Gas Chromatography*, 1999.
3. EPA Method TO-15, *Methods for the Determination of Toxic Organic Compounds in Air*, 1999 modified.
4. *Chemical Hygiene Plan*, Eurofins Lancaster Laboratories, Inc., current version.


Cross Reference:

Document	Document Title
Analysis #7090	Analysis of Air for Selected Volatile Organic Compounds by Gas Chromatography with Flame Ionization Detector and Photoionization Detector
1-P-QM-PRO-9015392	Routine Instrument Maintenance for Volatiles in Air by GC and GC/MS
1-P-QM-PRO-9015431	Cleaning and Handling of Summa Canisters
1-P-QM-PRO-9015433	Volatiles in Air Audit Process
1-P-QM-PRO-9017710	Computer Backup and Recovery
1-P-QM-QMA-9017309	Determining Method Detection Limits and Limits of Quantitation
1-P-QM-QMA-9017313	Establishing Control Limits
1-P-QM-QMA-9017358	Data and Record Storage, Security, Retention, Archival, and Disposal

Scope:

This method is used for the determination of polar and nonpolar VOCs in air samples that have been collected in specially treated (Summa™) canisters or Tedlar bags. The method is applicable to organic compounds that typically have molecular weights less than 200, vapor pressures >0.1 mm Hg, and low boiling points (-30° to 214°C). Target compounds are listed in Appendix B. Additional compounds may also be analyzed if requested and if they are feasible. The method is designed for the determination of ambient air in the low ppb concentration range [1 to 25 ppb(v)].

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In addition to ambient air samples, other air matrices such as soil gas, stack, industrial emissions, and indoor air from vapor intrusion can be successfully analyzed with proper precautions. Isopropanol is commonly used as a tracer gas and may be analyzed when requested. Please see Appendix C for the procedure.

The specific compound lists and corresponding method detection limits (MDLs) and limits of quantitation (LOQs) are found in the LIMS under the analysis numbers designated in the header of this SOP.

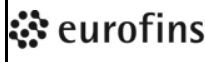
Basic Principles:

Air samples are collected in Tedlar bags or specially treated canisters (Summa™). A volume of the air is cryogenically trapped and desorbed into a gas chromatograph equipped with a capillary column and is interfaced directly to a mass selective detector (MSD). After desorption of the air sample, the gas chromatograph is temperature programmed and the MSD is scanned from 35 to 300 amu. VOCs are quantitated using a multilevel calibration generated from the analysis of certified VOC gas standards. Unknown peaks found on the total ion chromatogram (TIC) may be searched and identified using National Institute of Standards Technology (NIST) Spectral Library.

Reference Modifications:

Samples collected in Tedlar bags for analysis by GC/MS represent a method modification of TO-15, where only Summa™ canisters are described as sample collection devices. All method performance criteria in Method TO-15 (calibration, continuing calibration and QC samples) were established using Summa™ canisters. Therefore, the analysis of samples collected in Tedlar bags will use the calibration, continuing calibration and QC samples as listed in TO-15 (prepared in Summa™). Only sample specific information (sample results) are affected by the method modification to use Tedlar bags.

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Interferences:

Samples containing high concentrations of methane and CO₂ (e.g., landfill gases) can interfere with the early eluting VOCs and can shut down the MSD because of excessive signal. Water, which is normally removed by the microscale purge and trap at elevated levels can freeze and plug the sample trap. Water vapor that gets into the mass spectrometer can also suppress ionization and the signal output from the mass spectrometer.

High concentrations of VOCs in a sample can contaminate the analytical system and can carry over into subsequent samples.

Safety Precautions and Waste Handling:

All laboratory waste is accumulated, managed, and disposed of in accordance with all federal, state, and local laws and regulations.

See *Chemical Hygiene Plan* for general information regarding employee safety, waste management, and pollution prevention.


Care must be taken when handling high pressure cylinders and liquid nitrogen dewars. High pressure cylinders must always be secured.

Expired cylinder standards are returned to the vendor. Tedlar bag samples are disposed of as solid waste. No solvent solutions are used during this procedure. Analyzed Summa™ canisters are cleaned via procedure 1-P-QM-PRO-9015431.

Personnel Training and Qualifications:

All personnel performing this procedure must have documentation of reading, understanding, and agreeing to follow the current version of this SOP and a documented Demonstration of Capability.

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The initial training consists of reading this SOP then observing the procedure being carried out by an experienced analyst, allowing for questions and feedback. The trainee will then perform the procedure under the supervision of the trainer. The supervised training will occur for a period of time that will be dependent on the past experience of the trainee. Following the initial training, experienced analysts are available as a resource until no longer required. Analysts are considered proficient when the procedure can be carried out independently and they have successfully completed a Documented Demonstration of Capability.

Sample Collection, Preservation, and Handling:


Samples in Tedlar bags and specially treated (Summa™) canisters are stored at room temperature prior to analysis. Samples collected in Tedlar bags are analyzed as soon as possible and must be analyzed within 5 days of receipt in the laboratory. Samples collected in specially treated (Summa™) canisters must be analyzed within 30 days of collection. All samples are prescreened using the GC method detailed in Analysis #7090.

Apparatus and Equipment:

Below is a list of the suggested apparatus needed to perform this method. Any of the items below can be substituted for by an equivalent item provided method performance criteria are maintained.


1. Specially Treated canisters (Summa™) – leak free stainless steel pressure vessels (6 liter and 1 liter) with valve and specially prepared interior surface
2. Stainless steel pressure regulators, Veriflo 423XL with 1/4" Swagelok fittings, or equivalent
3. Copper and nickel tubing – 1/16", 1/8", 1/4" diameter
4. Stainless steel fittings (Swagelok) – 1/16", 1/8", and 1/4"

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5. Liquid nitrogen (low pressure dewar cylinder, 20 to 50 psi)
6. Vacuum pump
7. Humidifying chamber
8. Gas dilution manifold
9. Electronic Mass Flow Controllers (EMFCs) Tylan General, Model FC-260 calibrated to the following flow ranges:
 - 0 to 5 L/minute
 - 0 to 10 cc/minute
 - 0 to 100 cc/minute
 - 0 to 500 cc/minute
 - or EMFC's that can provide equivalent flow delivery ranges
10. EMFC control module – Tylan General, Model RO-28, or equivalent
11. Deactivated fused silica capillary tubing (0.53 µm I.D.)
12. Gas Standard(s) – Available from Scott Specialty Gases, or Spectra Gases
13. Syringes – Micro-mate, 30 cc
14. Gas dilution bulbs (glass)
15. Entech 7000, 7100, 7100A preconcentrator with canister manifold
16. Agilent 5890/5971, 5890/5972, 6890/5973 GC/MS, or equivalent, with NIST 98 mass spectral database or comparable database
17. GC Column – J&W DB624 30 m × 0.25 mm; df 1.4 cm or equivalent

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Reagents and Standards:

1. Gas standard(s) – Custom gas mixtures are purchased from Scott Specialty Gases and Spectra Gases, or equivalent; expiration is determined by the vendor.
2. The internal standard/BFB mix is purchased from Spectra Gases, Catalog #0052817, or equivalent; expiration is 30 days from preparation.
3. The Laboratory Control Sample (LCS), a custom mix, is purchased from Scott Specialty gases, or equivalent; this mix must be from a second source when compared to calibration standard mixes; expiration date is 1 year from preparation if not indicated by the vendor.


All of the above are stored at room temperature.

Recertification of Reagents and Standards:

Calibration and LCS standards that have exceeded manufacturer's expiration date may be recertified as valid using a second source standard mix that has a valid manufacturer's expiration date and the following procedure.

1. Prepare two analytical standards at a concentration of 10ppb. The first analytical standard will be prepared using the source standard of an expired lot -- intended for recertification. The second standard is prepared using the source standard of a lot that has not exceeded the manufacturer's expiration date.
2. Analyze the two separate analytical standard preparations above as part of an analytical sequence by method TO-15.
3. Generate a %drift (%D) report that calculates the %difference between the two standard preparations.

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4. The %D for all analytes must be less than 30% for the standard to be considered as valid for recertification. If any analytes exceed the 30% criteria, those analytes would be considered invalid for recertification and the recertification of that standard lot would be rejected. Any standard that fails recertification must be tagged as **“Expired Standard. Not Valid for Sample Analysis”**.
5. If the %D for all analytes is less than 30% the recertification is considered valid and the standard cylinder maybe used for sample analysis. A printed copy of the recertification %D report must be filed within the COA notebook and the standard cylinder is retagged with a recertification date.
6. Recertified standards are valid for one year from recertification date.

Calibration:

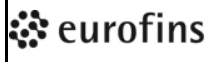
See Procedure A for preparation of calibration standards. See Procedure D for initial calibration requirements and E for continuing calibration requirements.

Procedure:

A. Preparation of calibration gas standards:

The VOCs in air samples and gas standards are automatically concentrated on a cryogenic trap and introduced into the GC/MS using the preconcentrator. An internal standard method of calibration is used, with three internal standards (bromochloromethane, 1,4-difluorobenzene, and chlorobenzene-d5). The internal standard is purchased as a certified gas standard in a pressurized cylinder. Prior to introduction of the sample or calibration standard, the internal standard mixture is cryogenically trapped on the high-volume sample trap from a specially treated canister.

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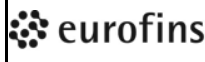
Each component in the internal standard mixture has a concentration of 100 ppb(v). If a sample volume of 250 cc is being used, 25 cc of this standard must be loaded onto the sample trap to produce a response equivalent to a 10 ppb(v) standard.

Initially a multipoint dynamic calibration with five levels of standards (1, 2, 5, 10, 25 ppb(v)) is performed. A sixth calibration level (70ppb (v)) is analyzed for the analytes in Table IV. Refer to Addendum for calibration requirements unique to NJ DEP. A gas dilution manifold is used to blend the certified gas standards to produce an intermediate gas standard. The intermediate standard is then diluted to working standards that are used to calibrate the GC/MS.

Two intermediate gas standards are prepared by flowing each of the stock custom mixes through the gas dilution manifold into a cleaned 6L Summa™ canister at a flow rate of 100 mLs/min for approximately 20 minutes. Since the concentration of the stock gas standards are at 1 ppm(v) each, the resulting intermediate standards have each compound present at a concentration of 500 ppb(v).

The two 500 ppb(v) intermediate standards are diluted down to a 100 ppb(v) and 10 ppb(v) working mix . Different volumes are taken from these working standard mixes, as listed below, to achieve the 6 point calibration.

<u>Working Mix</u>	<u>Volume Drawn</u>	<u>Calibration Std Achieved</u>
10 ppb(v)	25 mLs	1 ppb(v)
10 ppb(v)	50 mLs	2 ppb(v)
10 ppb(v)	125 mLs	5 ppb(v)
10 ppb(v)	250 mLs	10 ppb(v)
10 ppb(v)	625 mLs	25 ppb(v)
100 ppb(v)	175 mLs	70 ppb(v)

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Calibrations are generated by introducing various volumes of a single concentration standard (as listed above) or by introducing a constant volume of varying concentrations or by combination of both methods to achieve the 6 point calibration. Regardless of the calibration method, the quality control criteria defined below must be maintained. Calibration standards preparation is documented in a standards prep logbook.

A humid nitrogen blank must be passed through the system and analyzed after introduction of the calibration standards. The humid nitrogen is produced by bubbling nitrogen through reagent water. The humid nitrogen blanks are used to certify that the nitrogen, the preconcentrator, and the GC/MS system are clean. All compounds concentrations must be less than the specified reporting limits.

B. GC/MS instrument parameters:


Water can be removed from an air sample using the microscale purge and trap option. Nonpolar and polar VOCs can both be analyzed using the microscale purge and trap option.

Below are conditions recommended for the GC/MS system when analyzing polar and nonpolar VOCs:

Polar and Nonpolar VOCs (microscale purge and trap):

HP 5890 or 6890 (or equivalent) with electronic pressure programmable injection port
Column – J&W DB624 30 m x 0.25 mm; df 1.4 µm or equivalent
Carrier – Helium with flow set at 1.0 mL/min
Oven – Start at 35°C, hold 5 min, ramp at 4°C/min to 60°C, then ramp at 8°C/min to 220°C, and hold 2 min
HP 5971 or 5973 (or equivalent) with direct capillary interface
Solvent delay >4.0 min
Scan 35 to 300 amu, sampling 2³, 1.2 scan/sec
Transfer line temperature – 280°C
Threshold – 500
EI Condition – 70eV

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Parameters may be changed to optimize performance as long as calibration and resolution requirements are met.

C. GC/MS tuning:

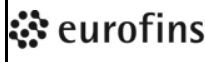
Daily (every 24 hours) prior to calibrating or running samples, the GC/MS must be demonstrated to meet the criterion for 4-bromofluorbenzene (BFB) shown in Table I. Twenty five nanograms of BFB are introduced into the GC/MS from a canister in the same manner as sample analysis. A background subtracted and averaged mass spectra including three scans on either side of the BFB peak apex must be used to check that all the key ion criteria in Table I are met. If the tuning conditions are not met, the analyst must retune the mass spectrometer or perform the necessary maintenance until all criteria are met.

D. GC/MS initial calibration:

After the tuning criterion has been met, use the cryogenic preconcentrator to inject the humid nitrogen and blended standard(s) as described above in the GC/MS to produce a six-point dynamic calibration. A calibration file must be created which includes the following information for each compound: the name, the retention time, the target ion to be used for quantitation, the qualifier ions, the expected relative abundances for each ion, the acceptance tolerances for each ion abundance, and the concentration in each calibration standard level. Table II lists the compounds and the quantitation ion and qualifier ions for each.

Update the responses of each compound at each level with the relative response factor (RRF) of each standard. Table III lists the compounds and the internal standard that each compound is associated with for quantitation. Calculate the average RRF and the relative standard deviation (RSD) of the RRF at each level over the working range of the curve for each compound. Table IV list the analytes that are included in the sixth level (70 ppb (v)) of the calibration. All other analytes are calculated as a 5-point calibration. The RSDs for the VOCs must be less than 30% and the minimum response factor greater than 0.010 for the calibration to be acceptable.

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Allowance can be made for up to two VOCs if the %RSDs of those two compounds are greater than 30% but less than 40% and the average RRFs are greater than 0.010 in the initial calibration.

One of the points for the initial calibration curve must be the same concentration as the daily calibration standard (e.g., 10 ppb(v) or 5 ppb(v) to meet NJ requirements). One of the calibration levels must have concentrations at or below the limit of quantitation for the compounds of interest. In addition to the five calibration levels, an MDL check standard is analyzed with each initial calibration to evaluate instrument sensitivity. The MDL check standard is at a concentration of 0.2 ppb(v) and prepared in the manner described under "Preparation of calibration gas standards". All compounds must be detected in the MDL check standard analysis.

The area response at each calibration level must be within 40% of the mean area response over the initial calibration range for each internal standard. The retention time shift for each of the internal standards at each calibration level must be within 20 seconds of the mean retention time over the initial calibration range for each internal standard.

If the initial calibration criteria are not met, the analyst must recalibrate and/or perform the necessary maintenance (see 1-P-QM-PRO-9015392) until all criteria are met. Once a compliant calibration is obtained, samples may be analyzed under the initial calibration for a period of 24 hours. This time period starts with the injection time of a BFB standard that meets the tuning criteria and ends 24 hours later. Any samples injected during this period meet the time requirements for the BFB tune and the calibration.

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E. Continuing calibration verification:

A check of the calibration curve must be performed once every 24 hours after a successful tune check. BFB and a continuing calibration verification (CCV) at the low- or mid-level concentration must be injected after every 24 hours and before any more air samples may be analyzed. The BFB must pass the tuning criteria established in Table I and the difference of the RRF for each compound in the CCV must be less than 30% from the average RRF established in the initial calibration for the continuing calibration verification to be acceptable. All the RRFs must also be greater than 0.010. If these criteria are met, the initial calibration response factors can be used to calculate subsequent sample concentrations during the next 24-hour period. If the CCV does not meet the acceptance criteria, it may be repeated. However, if two consecutive CCVs fail, then either the system must be recalibrated or two consecutive passing CCVs must be analyzed before sample analysis may resume.

F. Calibration calculations

1. Calculation of relative response factor (RRF)

$$RRF = \left(\frac{A_x}{A_{is}} \right) \left(\frac{C_{is}}{C_x} \right)$$

Where:


A_x = area of primary ion for compound

A_{is} = area of primary ion for internal standard

C_{is} = concentration of internal standard

C_x = concentration of compound in standard Calibration Calculations

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2. Percent difference:

$$\%D = \frac{(RRF_i - RRF_{cc})(100)}{RRF_i}$$

Where:

RRF_i = Average Relative Response Factor from initial calibration

RRF_{cc} = Relative Response Factor from continuing calibration

G. Quantitative sample analysis:

Summa™ canister samples must be handled as outlined in 1-P-QM-PRO-9015431. Each can is pressurized to ~10 psi(g) prior to analysis. The nominal sample volume used for analysis is 250 mL. However, this amount may be adjusted depending on the dilution factor determined from the pressurization and/or any dilutions needed for target analyte concentrations determined during the prescreening. The dilution factor must be applied to detected VOC concentrations during sample analysis:

$$D_f = \frac{X_a}{Y_a}$$


Where:

X_a = canister pressure (kPa, psia) absolute after dilution

Y_a = canister pressure (kPa, psia) absolute before dilution

The Summa™ canisters are loaded onto the cryogenic preconcentrator sample manifold in the positions corresponding to those assigned the samples in the run sequence list. Gently tighten the swagelok connections between the canister and the nickel sampling line (do not over-tighten). Quick connects can also be used. Air samples are automatically drawn from the canisters and introduced into the GC/MS system. A contact closure from the cryogenic preconcentrator at the end of the cryofocusing step starts the GC/MS system.

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Tedlar bags do not require or need pressurization. Samples in Tedlar bags are also loaded onto the appropriate manifold positions corresponding to those assigned the samples in the run sequence list. After attaching the Swagelok connection to the valve mechanism on the Tedlar bag, the valve is opened so that sample is automatically drawn from the bag as the system sequences through the samples.

When high concentrations of analytes or unknowns are found in a sample, a humid nitrogen blank may need to be injected after that sample to demonstrate the system has not been contaminated by the sample. However, this is very much subject to the determination of the analyst based on the concentration that was found in the sample and what, if anything, was found in the sample injected after the “contaminated” sample.

Carryover between samples is most likely to occur with polar and heavier molecular weight compounds that elute late in the chromatogram. The analyst must constantly be aware of the possibility of carryover from high-level samples. If carryover contamination is suspected during the analysis of a sample(s), the sample(s) must be reinjected on a clean system.

Samples that have on-column analyte concentrations which exceed the linear range of the calibration are diluted and/or a smaller sample volume taken. Samples are diluted with humid nitrogen and prepared in 1-L Tedlar bags using a 500 cc gas-tight syringe (for example: 100 cc of sample is added to a Tedlar containing 900 cc of humid nitrogen to create a 10-fold sample dilution with a final volume of 1000 cc). Use the initial injection to estimate the dilution or sample volume that is required to bring the analyte peak within the calibration range. The dilution factor or volume chosen must keep the response of the largest target peak within the upper half of the calibration range.

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The peak area for any internal standard in the sample and QC samples must not vary by more than $\pm 40\%$ from the area of the internal standards in the CCV. The retention time of each internal standard must also be within ± 0.33 minutes of the most recent continuing calibration standard. If one or both of these criteria are not met then the sample must be reanalyzed, undiluted (unless matrix interference is observed), after the analysis of an acceptable instrument blank. An acceptable instrument blank has all target compounds less than the reporting limit. If the reanalysis of the sample still shows internal standard response outside of the $\pm 40\%$ criteria, then the deviation is attributed to the sample matrix. An appropriate analysis comment explaining this occurrence must be included on the analytical report.

For Tedlar bag samples the dilution of overrange analyte concentrations and evaluation of internal standard responses is the same as with the Summa™ can sample process.

H. Interpretation of data:

1. Qualitative identification of target compounds

A positive identification is made on a target compound if:

- a. The GC relative retention time (RRT) of the component is within ± 0.06 min of the standard component.

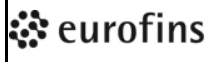
and

- b. All ions present in the reference mass spectra at a relative intensity greater than 10% are present in the sample spectra.

and

- c. The relative intensities of the target and qualifier ions are within $\pm 20\%$ when the reference and sample spectra are compared.

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or

- d. An experienced analyst makes a technical judgment that can be justified based on the data, even though one or more of the above criteria may not be true.

2. Calculation of target compound concentrations

The average response factor from the initial calibration is used to calculate the concentration of target compounds in the sample:

$$X_a = \frac{(A_x)(I_s)(Df)}{(A_{is})(RRF)}$$

Where:

X_a = target compound concentration, ppb(v)

A_x = Area of the quantitation ion for the target compound to be measured

A_{is} = Area of quantitation ion for the specific internal standard

I_s = Concentration of internal standard, ppb(v)

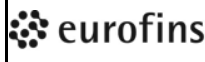
RRF = Average relative response factor from initial or continuing calibration

Df = Dilution factor

Note that all concentrations in this method are parts per billion volume (ppb(v)). See Appendix A for conversions to other units.

I. Library search of unknown peaks:

If requested, unknown peaks on the Total Ion Chromatogram (TIC) may be searched against the NIST Spectral library.

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1. Identification of unknown peaks

Tentative identification of unknown peaks is made, if:

- a. All ions present in the NIST reference mass spectra at a relative intensity greater than 10% are present in the sample spectra.

and

- b. The relative intensities the target and qualifier ions are within $\pm 20\%$ between the NIST reference and sample spectra.

or

- c. An experienced analyst makes a technical judgment that there is a positive match with the NIST library even though the one or more of the above criteria may not be true.

2. Estimation of unknown concentrations

The concentrations of tentatively identified compounds are estimated from the TIC area of the unknown peak and the nearest internal standard free of interferences using the equation below:

$$X_u = \frac{(A_x)(I_s)(Df)}{(A_{is})}$$

Where:

X_u = Unknown compound concentration, ppb(v)

A_x = TIC area of the unknown peak

A_{is} = TIC area of nearest internal standard


I_s = Concentration of internal standard present, ppb(v)

Df = Dilution factor

Calculations:

See Procedures F, G, H, and I.

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Data Handling and Storage:

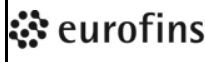
A hard copy report is generated for all samples and standards that are analyzed on the system. A short report consisting of a quantitation results page and a chromatogram is needed for standards and method blanks, and the LCS. Nontarget peaks in method blanks which have an area greater than 10% of the nearest internal standard must be searched against the NIST library and documented by printing copies of the peak spectrum and library search results. An extended report consisting of a quantitation page, a TIC, and background subtracted and reference spectra for all target compounds must be printed for all samples. Hard copies of library search results including a background subtracted spectrum of all unknown peaks that were searched and spectra of the three most probable matches from the NIST library must be generated when required. An experienced analyst reviews all data. A second analyst (auditor) reviews sample data following 1-P-QM-PRO-9015433 before verifying the data for reporting to the client.

Original hardcopies of all data are stored in the archives following 1-P-QM-QMA-9017358. All electronic data generated on the system is backed up by the Computer Services staff according to 1-P-QM-PRO-9017710.

Statistical Information/Method Performance:

Method acceptability was evaluated with a precision and accuracy study through analysis of LCS and LCSD samples. The data is maintained in Quality Assurance department files. Sensitivity is assessed on an ongoing basis with the MDL check standard. The LCS recoveries are compared to statistically generated limits for acceptance. The acceptance limits are stored in the LIMS and within the department. MDLs and LOQs are also stored in the LIMS system and readily accessible via the analysis numbers listed in the header of this SOP. Measurement of uncertainty, MDLs, and statistical limits are calculated, reviewed annually, and updated if necessary in accordance with 1-P-QM-QMA-9017309 and 1-P-QM-QMA-9017313.


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Quality Assurance/Quality Control:

- A. The air sampling system and the GC/MS system must be certified clean with humid nitrogen prior to analysis of samples. The method blank is performed by filling a designated Summa™ canister with humidified nitrogen and processing it through the analytical system as if it were a sample. The method blank analysis is performed per batch (≤ 20 samples). All target compounds must be less than the reporting limit, or the method blank needs to be repeated. If the method blank still does not meet the requirement of being less than the reporting limit, then maintenance will have to be performed on the system to remove the source of the blank contamination.
- B. The GC/MS tune must be validated daily and shown to meet the BFB requirements listed in Table I. If these requirements are not met, the GC/MS is to be retuned and BFB reanalyzed.
- C. An initial multipoint calibration with at least five points (see Procedure A, of this document, for the calibration range) must be generated with RSDs of the RRFs for all compounds less than 30% and all the average RRFs must be greater than 0.010. Allowance can be made for up to two VOCs if the RSDs of those two compounds are less than 40% and the average RRFs are greater than 0.010. An MDL check standard is analyzed to demonstrate instrument sensitivity. All compounds must be detected in the MDL check standard.
- D. Internal standard areas in samples, blanks, and LCS analyses must not vary more than $\pm 40\%$ from the area of the internal standard areas in the CCV. The RT of any internal standard may not vary by more than ± 0.33 min from the RT of the internal standards in the CCV.
- E. An instrument logbook is kept for documenting maintenance and instrumental problems. See 1-P-QM-PRO-9015392 for maintenance information.

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- F. A laboratory control sample and laboratory control sample duplicate (LCS/LCSD) are analyzed at the rate of one per every batch (≤ 20 samples) and after every initial calibration. The LCS standard is made from a source independent of the certified gas standard(s) used to generate the calibration. The expiration date for the prepared LCS is 30 days from the date of preparation from the source material. The recoveries of the LCS compounds must fall within the QC recovery limits for the analytical system to be considered in control. If the LCS and/or LCSD fail to meet recovery criteria, a new LCS standard must be prepared and analyzed. If this LCS and/or LCSD still fails to meet recovery criteria then a new calibration must be acquired. No sample data may be reported if the LCS/LCSD recoveries are below recovery windows. For LCS/LCSD recoveries that are above recovery windows, data may be reported if the compounds that recovered high in the LCS/LCSD are not detected in the associated samples. All recovery windows are statistically generated and evaluated annually. LCS/LCSD recovery windows are maintained in the LIMS system under the appropriate analysis number.

The LCS analyzed directly after the initial calibration functions as the initial calibration verification (ICV) for that particular calibration.

The analysis of the LCS also serves as a second source recertification of the calibration mixes referred to in Procedure, Section A.

- G. A sample duplicate (DUP) is analyzed at the rate of one per every batch (≤ 20 samples).
- H. For each lot of Tedlar bags received for use, a random sampling and analysis of a Tedlar bag per lot received is performed. The randomly selected Tedlar bag is filled with humidified nitrogen in the lab and analyzed for the full list of TO-15 analytes offered under this SOP. The results of the blank Tedlar bag analysis remain on file in the lab. Any failure of the Tedlar bag blank results in disqualification of that particular lot for use in the analysis of air samples. A failure is determined by evaluation of the Tedlar bag results. Common laboratory solvents such as acetone and/or methylene chloride are acceptable if detected at or near the method LOQ.

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Clients will be informed that if they are supplying their own Tedlar bags, it is highly recommended that they also submit a blank bag for analysis.

- I. Additional QC and/or Calibration samples or different requirements may be needed on state or project specific basis. These may include, but are not limited to, lower calibration standards, specific QC or reporting limits.

Comments:

The use of Tedlar bags is not specified in the method references. For some clients, sample collection in Tedlar bags may be desirable due to expense or areas where Summa™ canisters are too large to sample. The compound list must be evaluated when considering Tedlar bags because some polar compounds may permeate the Tedlar bag and contaminate the sample. Our internal requirement is to analyze all samples collected in Tedlar bags within 5 days of receipt.


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Table I
4-Bromofluorobenzene Key Ions and Ion Abundance Criteria

<u>Mass</u>	<u>Ion Abundance Criteria</u>
50	8% to 40% of mass 95
75	30% to 66% of mass 95
95	Base Peak, 100% Relative Abundance
96	5% to 9% of mass 95
173	<2% of mass 174
174	50% to 120% of mass 95
175	4% to 9% of mass 174
176	93% to 101% of mass 174
177	5% to 9% of mass 176


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Table II
Volatile Internal Standard with Corresponding Analytes Assigned for Quantitation

<u>Bromochloromethane</u>	<u>1,4-Difluorobenzene</u>	<u>Chlorobenzene-d5</u>
Propene	1,2-Dichloroethane	Toluene
Dichlorodifluoromethane	Benzene	Octane
Chlorodifluoromethane	Isooctane	trans-1,3-Dichloropropene
Freon 114	Heptane	Ethyl Methacrylate
Chloromethane	Trichloroethene	1,1,2-Trichloroethane
Vinyl Chloride	Ethyl Acrylate	Tetrachloroethene
1,3-Butadiene	1,2-Dichloropropane	2-Hexanone
Bromomethane	Methyl Methacrylate	Dibromochloromethane
Chloroethane	Dibromomethane	1,2-Dibromoethane
Dichlorofluoromethane	1,4-Dioxane	Chlorobenzene
Trichlorofluoromethane	Bromodichloromethane	1,1,1,2-Tetrachloroethane
Pentane	cis-1,3-Dichloropropene	Ethylbenzene
Acrolein	4-Methyl-2-Pentanone	m/p-Xylene
1,1-Dichloroethene	Tert-Amyl Methyl Ether	o-Xylene
Freon 113		Styrene
Acetone		Bromoform
Methyl Iodide		Cumene
Carbon Disulfide		1,1,2,2-Tetrachloroethane
Acetonitrile		1,2,3-Trichloropropane
3-Chloropropene		Bromobenzene
Methylene Chloride		4-Ethyltoluene
tert-Butyl Alcohol		1,3,5-Trimethylbenzene
Acrylonitrile		Alpha Methyl Styrene
trans-1,2-Dichloroethene		1,2,4-Trimethylbenzene
Methyl t-Butyl Ether		1,3-Dichlorobenzene
Hexane		1,4-Dichlorobenzene
1,1-Dichloroethane		1,2-Dichlorobenzene
Vinyl Acetate		Hexachloroethane
cis-1,2-Dichloroethene		1,2,4-Trichlorobenzene
2-Butanone		Hexachlorobutadiene
Ethyl Acetate		Naphthalene
Methyl Acrylate		2-Chlorotoluene

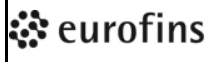
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Table II – Continued
Volatile Internal Standard with Corresponding Analytes Assigned for Quantitation

Bromochloromethane

Chloroform
1,1,1-Trichloroethane
Carbon Tetrachloride
Ethanol
Di-Isopropyl Ether
Ethyl Tert-Butyl Ether
Bromoethene
Cyclohexane
Tetrahydrofuran
Isopropanol
1,2-Dichloroethene (total)

1,4-Difluorobenzene

Chlorobenzene-d5

n-Propylbenzene
Tert-Butylbenzene
Sec-Butylbenzene
p-Isopropyltoluene
n-Butylbenzene
1,3-Dichloropropene (total)
Xylene (total)
Benzyl Chloride

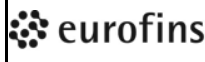
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Table III
Characteristic Ions for Volatile Compounds

<u>Compound</u>	<u>Primary Ion</u>	<u>Secondary Ions</u>
Bromochloromethane (IS)	130	128
Propene	41	39, 42
Dichlorodifluoromethane	85	87
Chlorodifluoromethane	51	67
Freon 114	85	135
Chloromethane	50	52
Vinyl Chloride	62	64
1,3-Butadiene	54	53, 39
Bromomethane	94	96
Chloroethane	64	66
Dichlorofluoromethane	67	69, 47
Trichlorofluoromethane	101	103
Pentane	43	41, 42
Acrolein	56	55
1,1-Dichloroethene	61	96, 63
Freon 113	103	151, 101
Acetone	43	58
Methyl Iodide	142	127
Carbon Disulfide	76	78, 44
Acetonitrile	41	40, 39
3-Chloropropene	76	39
Methylene Chloride	84	86, 49
tert-Butyl Alcohol	59	41, 57
Acrylonitrile	53	52, 51
trans-1,2-Dichloroethene	61	96, 98
Methyl t-Butyl Ether	73	57, 43
Hexane	57	41, 43, 86
1,1-Dichloroethane	63	65
Vinyl Acetate	43	86
cis-1,2-Dichloroethene	61	96, 98
2-Butanone	72	43, 57
Ethyl Acetate	70	61
Methyl Acrylate	55	85, 58


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Table III – Continued
Characteristic Ions for Volatile Compounds

<u>Compound</u>	<u>Primary Ion</u>	<u>Secondary Ions</u>
Chloroform	83	85, 47
1,1,1-Trichloroethane	97	99, 61
Carbon Tetrachloride	117	119
1,4-Difluorobenzene (IS)	114	88
1,2-Dichloroethane	62	64
Benzene	78	77, 50
Isooctane	57	41, 56, 99
Heptane	43	57, 71, 100
Trichloroethene	130	132, 95
Ethyl Acrylate	55	73, 99
1,2-Dichloropropane	63	41, 62
Methyl Methacrylate	69	41, 100
Dibromomethane	174	93, 176, 95
1,4-Dioxane	88	58, 43
Bromodichloromethane	83	85, 129
cis-1,3-Dichloropropene	75	39, 77
4-Methyl-2-Pentanone	43	58, 100
Chlorobenzene-d5 (IS)	117	82
Toluene	91	92
Octane	43	57, 85
trans-1,3-Dichloropropene	75	39, 77
Ethyl Methacrylate	69	41, 99
1,1,2-Trichloroethane	97	83
Tetrachloroethene	166	164, 131
2-Hexanone	43	58, 85
Dibromochloromethane	127	129, 131
1,2-Dibromoethane	107	109
Chlorobenzene	112	77, 114
1,1,1,2-Tetrachloroethane	131	133, 117, 119
Ethylbenzene	91	106
m/p-Xylene	91	106
o-Xylene	91	106
Styrene	104	78, 51
Bromoform	173	171, 93
Cumene	105	120, 77

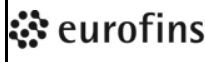
 Lancaster Laboratories	Document Title: The Automated Determination of Volatile Organic Compounds in Air Collected in Specially Treated Canisters or Tedlar Bags Using Cryogenic Preconcentration and Gas Chromatography with Mass Selective Detection Using EPA Method TO-14 or TO- 15	Eurofins Document Reference: 1-P-QM-WI-9015155
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Table III – Continued
Characteristic Ions for Volatile Compounds

<u>Compound</u>	<u>Primary Ion</u>	<u>Secondary Ions</u>
1,1,2,2-Tetrachloroethane	83	85
1,2,3-Trichloropropane	110	75, 112
Bromobenzene	156	158
4-Ethyltoluene	105	120
1,3,5-Trimethylbenzene	105	120
Alpha Methyl Styrene	118	117, 103
1,2,4-Trimethylbenzene	105	120
1,3-Dichlorobenzene	146	148, 111
1,4-Dichlorobenzene	146	148, 111
1,2-Dichlorobenzene	146	148, 111
Hexachloroethane	117	119, 201, 166
1,2,4-Trichlorobenzene	180	182, 184
Hexachlorobutadiene	225	227, 223
Ethanol	45	46, 43
Di-Isopropyl Ether	45	87, 59
Ethyl Tert-Butyl Ether	59	87, 57
Tert-Amyl Methyl Ether	73	55, 87
Naphthalene	128	102
Bromoethene	106	108
Cyclohexane	56	84
2-Chlorotoluene	91	126
Tetrahydrofuran	42	71, 72
N-Propylbenzene	91	120
Tert-Butylbenzene	119	91, 134
Sec-Butylbenzene	105	134
p-Isopropyltoluene	119	134
n-Butylbenzene	91	92, 134
Isopropanol	45	43
Benzyl Chloride	91	92, 126, 128



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Table IV
Volatile Compounds in the Extended Range Calibration

Compound

Propene
Vinyl Chloride
Pentane
Ethanol
Acetone
Methylene Chloride
Tert-Butyl Alcohol
1,1-Dichloroethene
Trans-1,2-Dichloroethene
1,1-Dichloroethane
Hexane
Cis-1,2-Dichloroethene
1,2-Dichloroethene (total)
2-Butanone
Benzene
1,2-Dichloroethane
Isooctane
1,1,1-Trichloroethane
Heptane
Carbon Tetrachloride
Trichloroethene
Toluene
1,1,2-Trichloroethane
Tetrachloroethene
Ethylbenzene
m,p-Xylene
o-Xylene
Xylene (total)

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Appendix A Air Calculations

All default units for the TO-15 method are ppb(v). To convert to wt./volume such as $\mu\text{g}/\text{m}^3$ or ng/Liter:
e.g., Benzene M.W. 78.12 g/mole at 10 ppb(v)

In one Liter, 10×10^{-9} Liters will be benzene.

$$\frac{10 \times 10^{-9} \text{ Liter}}{24.45 \text{ Liters/mole (STP)}} = 0.409 \times 10^{-9} \text{ moles benzene}$$

$$0.409 \times 10^{-9} \text{ moles benzene/Liter sample} \times 78.12 \text{ g/mole} = 31.9 \text{ ng/Liter benzene}$$

$$0.409 \times 10^{-9} \text{ moles benzene/Liter sample} \times 78.12 \text{ g/mole} = 31.9 \text{ ug}/\text{m}^3 \text{ benzene}$$


Refer to Appendix B for the molecular weight of specific compounds.

units: 1 atm = 760 mm Hg = 760 torr = 29.92 inches Hg = 1.01 bars = 101.3 Kpa

1000 Liters = 1 m^3

Notes: STP where $T=25^\circ\text{C}$

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Appendix B

Molecular Weight and CAS Number for Volatile Compounds

<u>Compound Name</u>	<u>Mol Wt</u>	<u>CAS No</u>
Propene	42.08	115-07-1
Dichlorodifluoromethane	120.91	75-71-8
Chlorodifluoromethane	86.47	75-45-6
Freon 114	170.92	76-14-2
Chloromethane	50.49	74-87-3
Vinyl Chloride	62.50	75-01-4
1,3-Butadiene	54.09	106-99-0
Bromomethane	94.94	74-83-9
Chloroethane	64.51	75-00-3
Dichlorofluoromethane	102.92	75-43-4
Trichlorofluoromethane	137.37	75-69-4
Pentane	72.15	109-66-0
Acrolein	56.06	107-02-8
1,1-Dichloroethene	96.94	75-35-4
Freon 113	187.38	76-13-1
Acetone	58.08	67-64-1
Methyl Iodide	141.94	74-88-4
Carbon Disulfide	76.14	75-15-0
Acetonitrile	41.05	75-05-8
3-Chloropropene	76.53	107-05-1
Methylene Chloride	84.93	75-09-2
<i>tert</i> -Butyl Alcohol	74.12	75-65-0
Acrylonitrile	53.06	107-13-1
<i>trans</i> -1,2-Dichloroethene	96.94	156-60-5
Methyl <i>t</i> -Butyl Ether	88.15	1634-04-4
Hexane	86.18	110-54-3
1,1-Dichloroethane	98.96	75-34-3
Vinyl Acetate	86.09	108-05-4
<i>cis</i> -1,2-Dichloroethene	96.94	156-59-2
2-Butanone	72.11	78-93-3
Ethyl Acetate	88.11	141-78-6
Methyl Acrylate	86.09	96-33-3
Chloroform	119.38	67-66-3
1,1,1-Trichloroethane	133.40	71-55-6
Carbon Tetrachloride	153.82	56-23-5
1,2-Dichloroethane	98.96	107-06-2
Benzene	78.11	71-43-2
Isooctane	114.23	540-84-1

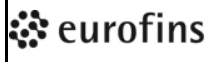
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Appendix B – Continued

Molecular Weight and CAS Number for Volatile Compounds

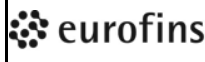
<u>Compound Name</u>	<u>Mol Wt</u>	<u>CAS No</u>
Heptane	100.20	142-82-5
Trichloroethene	131.39	79-01-6
Ethyl Acrylate	100.12	140-88-5
1,2-Dichloropropane	112.99	78-87-5
Methyl Methacrylate	100.12	80-62-6
Dibromomethane	173.83	74-95-3
1,4-Dioxane	88.11	123-91-1
Bromodichloromethane	163.83	75-27-4
<i>cis</i> -1,3-Dichloropropene	110.97	10061-01-5
4-Methyl-2-Pentanone	100.16	108-10-1
Toluene	92.14	108-88-3
Octane	114.23	111-65-9
<i>trans</i> -1,3-Dichloropropene	110.97	10061-02-6
Ethyl Methacrylate	114.14	97-63-2
1,1,2-Trichloroethane	133.40	79-00-5
Tetrachloroethene	165.83	127-18-4
2-Hexanone	100.16	591-78-6
Dibromochloromethane	208.28	124-48-1
1,2-Dibromoethane	187.86	106-93-4
Chlorobenzene	112.56	108-90-7
1,1,1,2-Tetrachloroethane	167.85	630-20-6
Ethylbenzene	106.17	100-41-4
<i>m/p</i> -Xylene	106.17	1330-20-7
<i>o</i> -Xylene	106.17	95-47-6
Styrene	104.15	100-42-5
Bromoform	252.73	75-25-2
Cumene	120.19	98-82-8
1,1,2,2-Tetrachloroethane	167.83	79-34-5
1,2,3-Trichloropropane	147.43	96-18-4
Bromobenzene	157.01	108-86-1
4-Ethyltoluene	120.19	622-96-8
1,3,5-Trimethylbenzene	120.19	108-67-8
Alpha Methyl Styrene	118.18	98-83-9
1,2,4-Trimethylbenzene	120.19	95-63-6
1,3-Dichlorobenzene	147.00	541-73-1
1,4-Dichlorobenzene	147.00	106-46-7
Benzyl chloride	126.59	100-44-7
1,2-Dichlorobenzene	147.00	95-50-1

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Appendix B – Continued

Molecular Weight and CAS Number for Volatile Compounds

<u>Compound Name</u>	<u>Mol Wt</u>	<u>CAS No</u>
Hexachloroethane	236.74	67-72-1
1,2,4-Trichlorobenzene	181.45	120-82-1
Hexachlorobutadiene	260.76	87-68-3
Ethanol	46.07	64-17-5
Di-isopropyl Ether	102.18	108-20-3
Ethyl Tert-Butyl Ether	102.18	637-92-3
Tert-Amyl Methyl Ether	102.18	994-05-8
2-Chlorotoluene	126.58	95-49-8
Cyclohexane	84.16	110-82-7
Bromoethene	106.95	593-60-2
Naphthalene	128.18	91-20-3
Tetrahydrofuran	72.11	109-99-9
n-Propylbenzene	120.19	103-65-1
Tert-Butylbenzene	134.22	98-06-6
Sec-Butylbenzene	134.22	135-98-8
p-Isopropyltoluene	134.22	99-87-6
n-Butylbenzene	134.22	104-51-8

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Appendix C

The analysis of Isopropanol is a semi-quantitative analysis step performed in conjunction with TO-15 analysis. It does not require the same degree of calibration and QC. The sections noted below address the information pertinent to the analysis. For Safety, Sample Handling, and Standards Preparation information see the corresponding sections in the body of this method.

Note that all concentrations in this method are parts per billion volume (ppb(v)). See Appendix A for conversions to other units. The MW of isopropanol is 60.06.

Background Information:


Isopropanol is used as tracer gas while field sampling in Summa™ canisters for soil vapor analysis. The purpose of this analysis is to ensure that the sample collected in the field is a true representation of the soil vapor.

Procedure:

Prepare a single point at 4 ppm(v). Analyze on the GC/FID. Samples are screened on the GC/FID prior to GC/MS analysis. If the isopropanol is greater than 4 ppm(v) on the GC/FID, The client is contacted and informed of the problem with the sample collection.

The single point standard is analyzed following the check standard or initial calibration standards but before the daily method blank. A relative response factor is established according to the Procedure section of this document. A standard at 10 ppb(v) is analyzed annually to determine that isopropanol can be detected at this level. Samples are quantitated for isopropanol. The limit of quantitation is reported as 10 ppb(v). If the calculated value of this compound is less than 10 ppb(v) it is reported as a non-detect (N.D.). If the calculated value of this compound is greater than 10 ppb(v) the sample result is reported as an estimated concentration.

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Appendix C – Continued

Calculations:

1. Calculation of relative response factor (RRF)

$$RRF = \left(\frac{A_x}{A_{is}} \right) \left(\frac{C_{is}}{C_x} \right)$$

Where:

A_x = area of primary ion for compound

A_{is} = area of primary ion for internal standard

C_{is} = concentration of internal standard

C_x = concentration of compound in standard Calibration Calculations

2. Calculation of isopropanol concentration

The response factor from the single point calibration is used to calculate the concentration of target compounds in the sample:

$$X_a = \frac{(A_x)(I_s)(Df)}{(A_{is})(RRF)}$$

Where:

X_a = target compound concentration, ppb(v)

A_x = Area of the quantitation ion for the target compound to be measured

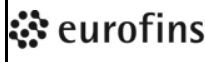
A_{is} = Area of quantitation ion for the specific internal standard

I_s = Concentration of internal standard, ppb(v)

RRF = Relative response factor from a single point calibration

Df = Dilution factor

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Addendum

This addendum contains elements necessary to perform TO-15 analysis to comply with NJ DEP requirements.

Sample Handling:

1. Due to loss of pressure that occurs naturally during the storage of canisters, a 15 calendar day time limit is placed on the time that canisters can be out of the laboratory. For canisters, that are received outside of the 15 day limit, the client is contacted and informed that their sample results may be invalidated by NJDEP. The holding time for canisters once received at the lab is still 30 days.
2. While sampling rates and needs vary based on the event, the standard equipment set-up for NJDEP sampling includes a Summa™ canister, flow controller, critical orifice, pressure gauge and a filter.
3. A Field Test Data Sheet (FTDS) accompanies every canister supplied for a field sampling event. An example FTDS is provided at the end of this addendum.


Initial Calibration:

Initial calibration for the analysis samples to meet NJ DEP requirements constitutes the use of a low calibration point of 0.5 ppb(v). Therefore, the calibration consists of five levels of standards at the following concentrations: 0.5, 1, 2.5, 5, 12.5 ppb(v).


Quality Assurance/Quality Control:

1. Method Blank – The method blank can not contain target analytes in excess of the NJ DEP reporting limit of 0.5 ppb(v)

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2. To be considered acceptable, the LCS recovery must be within 70% to 130% of the spiked value for 90% of the compounds.
3. To meet NJ DEP requirements, all samples require an internal chain of custody (COC)

 Lancaster Laboratories	Document Title: The Automated Determination of Volatile Organic Compounds in Air Collected in Specially Treated Canisters or Tedlar Bags Using Cryogenic Preconcentration and Gas Chromatography with Mass Selective Detection Using EPA Method TO-14 or TO-15	Eurofins Document Reference: 1-P-QM-WI-9015155

METHOD TO-15 CANISTER SAMPLING FIELD TEST DATA SHEET

A. GENERAL INFORMATION

Site Location: _____
 Site Address: _____
 Field ID No: _____ Size of Canister: _____
 Sampling Date(s): _____ Canister Serial No: _____
 Shipping Date: _____ Flow Controller No: _____

B. SAMPLING INFORMATION

TEMPERATURE (Fahrenheit)

	Interior	Ambient	Maximum	Minimum
Start				
Stop				

PRESSURE (inches of Hg)

	Ambient	Maximum	Minimum
Start			
Stop			

CANISTER PRESSURE (inches of Hg) FROM GAUGE

Start		
Stop		

SAMPLING TIMES (24 hour clock)

	Local Times	Elapsed Time Meter Reading
Start		
Stop		

Signature/Title of Investigator

C. LABORATORY INFORMATION

FLOW RATES (ml/min)

	Flow Controller Readout	
Shipping out from Lab		required (from lab record log) after return
Receiving in Lab		(if applicable)

CANISTER PRESSURE

	Inches of Hg	
Initial Pressure (to field)		required (from lab record log) after return
Final Pressure (from field)		required (from lab record log) after return

Data Shipped: _____

Date Received: _____

Individual Canister Certification (provide File #): _____

Batch Certification (provide Batch ID#): _____

Signature/Title
GC/MS Analyst for TO-15

APPENDIX B
Health and Safety Plan (HASP)
Amendment

Stabilus, Inc
120 Tulip Drive
Gastonia, NC 28052

HEALTH AND SAFETY PLAN AMENDMENT 1

**Operable Unit 2 North Penn Area 5 Superfund Site
Pre-Design Investigation
Colmar, Pennsylvania**

Prepared by

Geosyntec 
consultants

engineers | scientists | innovators

1787 Sentry Parkway West
Building 18, Suite 120
Blue Bell, PA 19422

Project Number: PH0013

Revised: 2 April 2014

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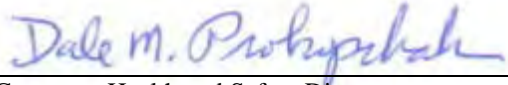
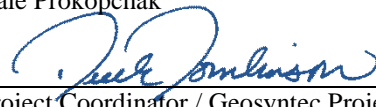

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1. SIGNATURES

1.1 Preparers and Reviewers

This HASP, which must be maintained on Site when field work is being performed, addresses the health and safety hazards of each phase of Site operation, including the procedures and equipment required for worker protection. Only the Site Health and Safety Officer (SHSO) can change or amend this document, in agreement with the Environmental Health and Safety Coordinator (EHSC), and Project Manager. The SHSO must initial any change made to the HASP at the relevant section. Major amendments (e.g., changes in personal protective equipment, addition of tasks, etc.) must be documented in Section 3 and in Appendix A. This HASP must be reviewed and amended on an annual basis for projects lasting more than one year.

Prepared by:	 Emily Jacesko	2 April 2014 Date
Reviewed by:	 Corporate Health and Safety Director – Dale Prokopchak	2 April 2014 Date
Approved by:	 Project Coordinator / Geosyntec Project Manager – Derek Tomlinson	2 April 2014 Date
Approved by: (as needed)	 Geosyntec Project Director – Chris Voci	2 April 2013 Date

Copy Cover Sheet to: EHSC

This HASP has been given to the following subcontractor(s) in accordance with the Occupational Safety and Health Administration (OSHA) HAZWOPER Standard, per Chapter 29 of Code of Federal Regulations (CFR), Subsection 1910.120.

Subcontractor: _____ Representative: _____ Date: _____

Subcontractor: _____ Representative: _____ Date: _____

Subcontractor: _____ Representative: _____ Date: _____



Instructions for Injury Response

IF LIFE THREATENING: CALL 911

If not life threatening but requiring emergency care:

Seek immediate medical attention at the hospital/facility that provides emergency care shown on **FIGURE 1A**.

- **Once the emergency situation has stabilized, follow the “Instructions for Incident Reporting” included in this HASP.**

If Not Requiring Emergency Care:

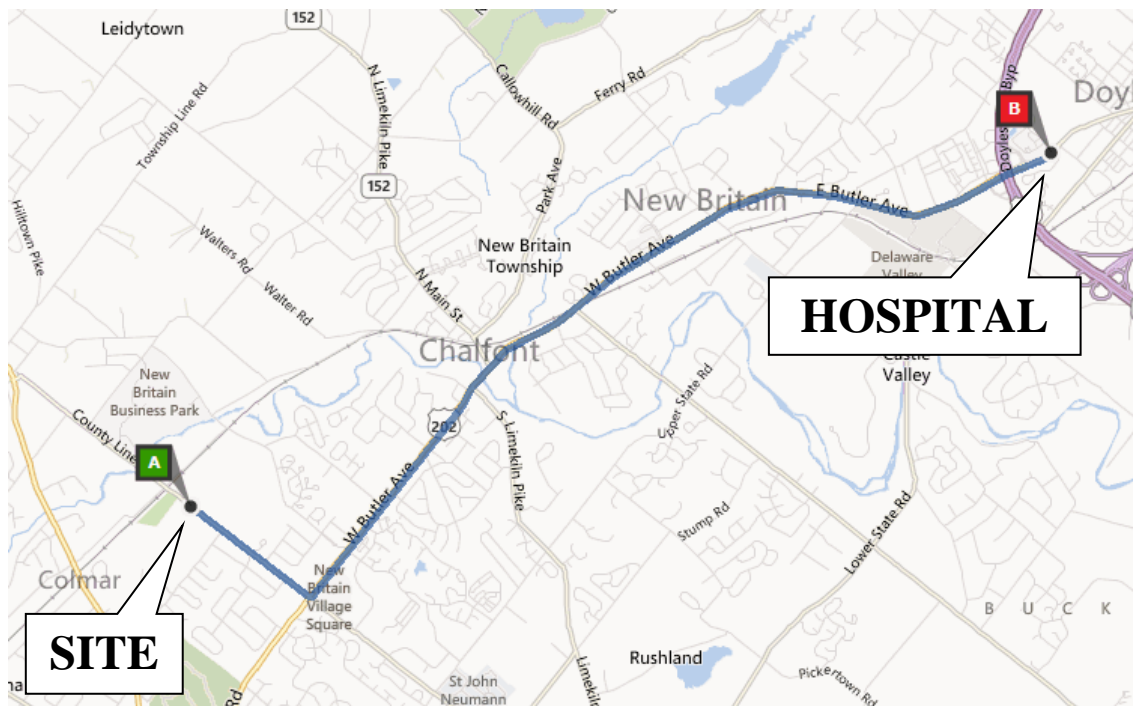
Manager/Supervisor calls the EHS Department at **(804) 349-8067 (Dale Prokopchak)** or **(404) 435-4722 (Ersin Yalcin)** to discuss appropriate medical attention (even if he/she thinks medical attention is not required). If professional care is needed, contact **WorkCare** at **(888) 449-7787** to get assistance.

- **Present the medical care provider with the TEAR-OUT FORMS (“Instructions to Medical Provider” and “Physical Status for Return to Work”) included in this HASP.**
- **Follow the “Instructions for Incident Reporting” included in this HASP within one hour.**

FIGURE 1A

ROUTE TO HOSPITAL

Doylestown Hospital
215-345-2200
595 West State Street
Doylestown, PA



Written Directions to Hospital from Site:

6.5 miles, 12 minutes driving

Depart 92 County Line Road (make right) toward Richardson Road

Turn left onto US-202/W. Butler Pike (0.9 miles)

Keep straight on US-202 North (4.9 miles)

Keep straight onto West State Street (0.1 miles)

Make U-turn at Progress Drive (0.5 miles)

Arrive at 595 West State Street.

FIGURE 1B

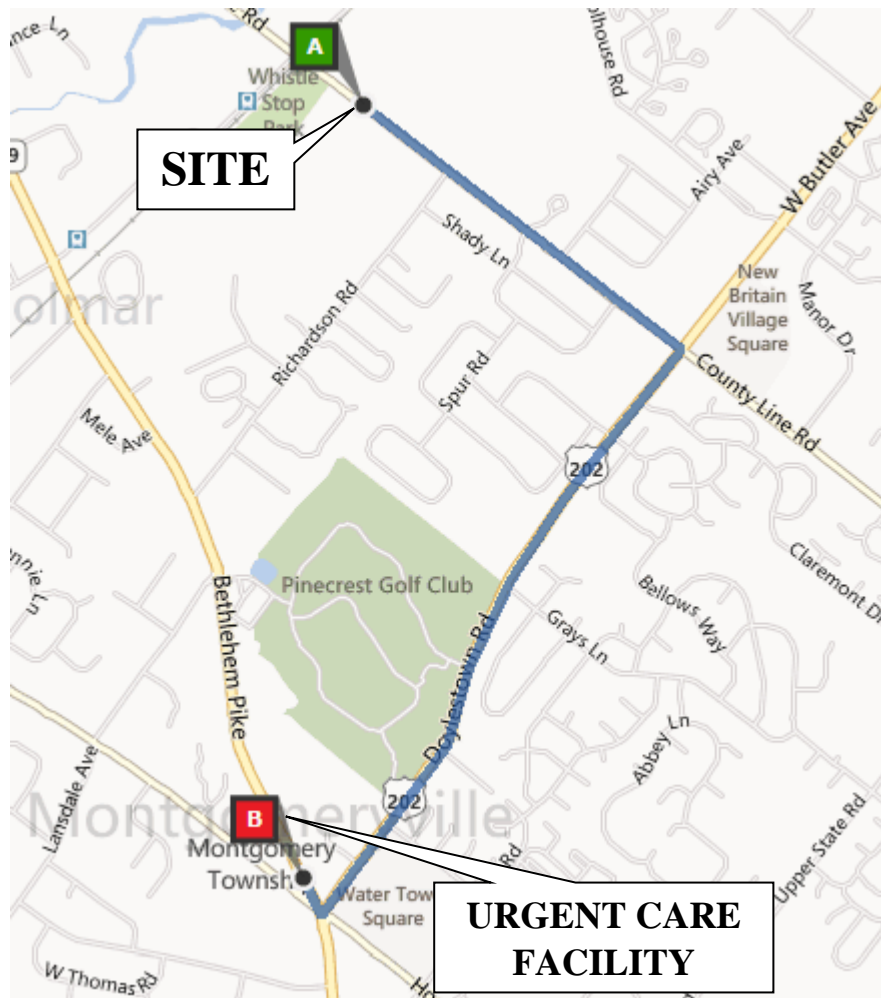
ROUTE TO URGENT CARE FACILITY

Advanced Urgent Care

267-263-2298

721 Bethlehem Pike

Montgomeryville, Pa



Written Directions to Urgent Care Facility from Site:

2.5 miles, 4 minutes driving

Depart 92 County Line Road (make right) toward Richardson Road

Turn right onto US-202/W. Butler Pike (0.9 miles)

Turn right onto PA-309/Bethlehem Pike (1.5 miles)

Arrive at 721 Bethlehem Pike.

FIGURE 2
SITE MAP



EMERGENCY RESPONSE PROCEDURES

- The Site Health and Safety Officer (SHSO), or designated alternate, should be immediately notified via the on-site communication system. The SHSO assumes control of the emergency response.
- If applicable, the SHSO must immediately notify off-site emergency responders (i.e., fire department, hospital, police department, etc.) and must inform the response team of the nature and location of the emergency on Site.
- If applicable, the SHSO calls for evacuation of the Site. Site workers should move to their respective refuge stations using the evacuation routes provided on the Site Map (Figure 2).
- For small fires, flames should be extinguished using the fire extinguisher. Large fires should be handled by the local fire department.
- If a worker is injured, the procedures presented in “Instructions for Injury Response”, located in the front of this HASP, must be implemented immediately.
- After an incident has stabilized, the procedures presented in “Instructions for Incident Reporting”, located in the front of this HASP, must be followed.

EMERGENCY RESPONSE CONTACT INFORMATION

<i>Contact</i>	<i>Telephone Numbers</i>		<i>Date of Pre-Emergency Notification (if required)</i>
	<i>Office</i>	<i>Alternate (Type)</i>	
Fire Department – Chalfont	911	(215) 822-9685 (direct)	
Police Department – Chalfont	911	(215) 348-3524 (direct)	
Hospital - Doylestown Hospital	911	(215) 345-2200 (direct)	
Project Coordinator - Derek Tomlinson	(267) 419-3102	(267) 218-0835 (cell)	
Project Director - Chris Voci	(267) 419-3100	(609) 613-0998 (cell)	
Director of Environment, Health & Safety – Dale Prokopchak	(804) 332-6376	(804) 349-8067 (cell)	
Environmental, Health & Safety Coordinator – Scott Douglas	(609) 493-9002	(617) 359-1465 (cell)	
Utility Emergencies	811		
EPA RPM – Sharon Fang	(215) 814-3018		
PADEP – Dennis Kutz	(484) 250-5784		
Stabilus Point of Contact: Joel Bolstein	(215) 918-3555	(267) 880-2655 (cell)	
Site Contact: Constantia-Colmar, Inc. Richard Klecker	(215) 997-6222	(267) 718-9421 (cell)	

Dear Medical Provider:

On behalf of Geosyntec Consultants/MMI Engineering, you are authorized to evaluate and treat the above Geosyntec/MMI employee today for an alleged work-related injury or illness.

Employee Name: _____

Alleged Injury: _____

Date of Alleged Injury: _____

Date of Medical Evaluation: _____

Geosyntec/MMI strives to reduce OSHA recordables; therefore, **please do not prescribe or dispense prescription medications if OTC medications or non-prescription strength can be used.** It is our primary interest to ensure this employee returns to work full duty. If a full duty release is not possible, Geosyntec/MMI may be able to find light duty for the **employee; unless it is unavoidable, please do not prescribe lost time.** We would appreciate it if you would complete the attached form “Physical Status for Return to Work”, or a similar form, to assist us in evaluating this employee’s work capabilities.

- Please fax a copy of all medical paperwork and “Physical Status for Return to Work Form” to Dale Prokopchak at (804) 332-6732.
- Invoices and supporting medical records should be mailed to:

Human Resources Department
Geosyntec Consultants
900 Broken Sound Parkway, NW, Suite 200
Boca Raton, FL 33487
Phone: 561.922.1112
Fax: 561.922.1101

Thank you for your assistance.

Very truly yours,

Dale Prokopchak, CIH, CSP
Director of Environmental Health and Safety

PHYSICAL STATUS FOR RETURN TO WORK
PLEASE FAX COMPLETED FORM TO DALE PROKOPCHAK AT (804) 332-6732

Employee Name _____ Date of Injury/Illness _____

TO BE COMPLETED BY TREATING PHYSICIAN

Diagnosis _____

I saw and treated this patient on (date) _____ and:

- ___ Release the patient to full duty with no limitations on (date) _____
- ___ Patient may return to work with the following limitation on (date) _____ and may work an 8 hr. shift unless specified otherwise.

LIFTING CAPACITY

- ___ Occasional lifting (10 lbs. max.) and lifting and carrying occasionally. Walking and standing occasionally.
- ___ Occasional lifting (20 lbs. max.). Significant walking, standing; or sitting with pushing and pulling with arms or legs.
- ___ Occasional lifting (50 lbs. max.) with frequent lifting and/or carrying up to 25 pounds.

OTHER ACTIVITIES

		SINGLE DURATION					IN AN 8 HOUR DAY PATIENT MAY DO				
LIMITATION	NO LIMITATION	< 1/2 hr	1/2-1 hr	1-2 hr	2-4 hr	4-6 hr	1/2-1 hr	1-2 hr	2-4 hr	4-6 hr	6-8 hr
SIT											
STAND											
WALK											
USE RIGHT HAND											
USE LEFT HAND											

	NO LIMITATION	FREQUENTLY (31%-60%)	OCCASIONALLY (1%-.30%)	NEVER
BEND				
SQUAT				
CLIMB				
REACH OVERHEAD		WEIGHT LIMIT	WEIGHT LIMIT	
REACH SHOULDER		WEIGHT LIMIT	WEIGHT LIMIT	
PUSHING/PULLING		WEIGHT LIMIT	WEIGHT LIMIT	

Other instructions or limitations:

Estimated length of time of modified duty: _____

- ___ These restrictions are in effect until (date) _____ or until patient is reevaluated on (date) _____
- ___ Patient is totally incapacitated at this time. Patient will be reevaluated on (date) _____

Physician Signature _____ Date _____

ADDITIONAL NOTES:



Instructions for Incident Reporting



Once an emergency situation has been stabilized, or within one hour of a non-emergency incident:

Manager/Supervisor calls the EHS Department at **(804) 349-8067** or **(404) 435-4722**—to discuss appropriate medical attention. If unable to contact the EHS Department within one (1) hour, a detailed voicemail with information about the incident must be provided and if non-emergency professional care is needed, contact **WorkCare** at **(888) 449-7787** to get assistance.

- Within 24 hours, the Manager/Supervisor completes a draft of the “Manager’s Report of Incident”, located in this HASP and on the EHS webSite, and sends to HR at (561) 922-1101.
- Manager/Supervisor forwards the finalized paperwork within 48 hours to both EHS (dprokopchak@geosyntec.com); fax (804) 332-6732 and HR; fax (561) 922-1101 for review, documentation, and implementation into our case management program.
- Contractors are responsible for compliance with their internal safety procedures regarding Incident Reporting. Geosyntec will document the Contractor’s incident in their Project Logbook.
- In the event of a vehicle accident that does not involve injuries, please follow the procedures outlined in EHS 105—Driver Safety.

Contact Information

Dale Prokopchak: office: 804.332.6376 | cell: 804.349.8067 | fax: 804.332.6732 | dprokopchak@geosyntec.com

Ersin Yalcin: office: 678.202.9552 | cell: 404.435.4722 | fax: 678.202.9501 | eyalcin@geosyntec.com

DRIVER'S REPORT OF ACCIDENT – PAGE 1

Driver's Report of Accident

Do not argue at the scene of the accident. Be courteous and show your license willingly.

Your Vehicle

Name of Driver _____
 Odometer Reading _____
 Vehicle I.D. No. _____
 License Plate No. _____ State _____
 Place of Accident _____

 City/State _____
 Direction of Travel _____
 Speed _____

Other Vehicle

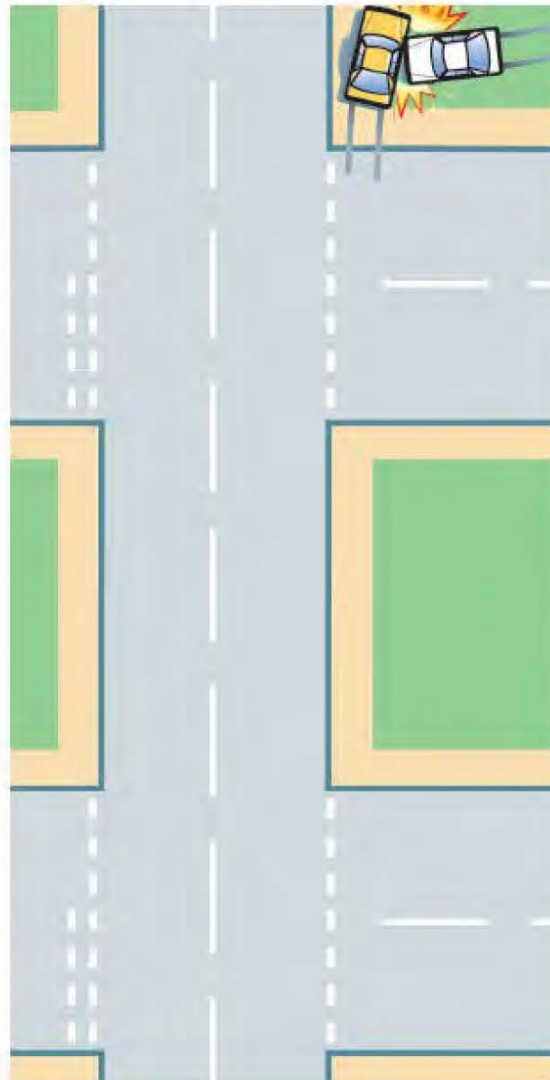
Name of Driver _____
 Address _____

 Phone No. _____
 Driver's License No. _____
 License Plate No. _____ State _____
 Vehicle I.D. Number _____
 Year/Model _____
 Owner of Vehicle _____
 Address of Owner _____

 Insured by _____
 Direction of Travel _____
 Approximate Speed _____

Diagram of Accident

Using the diagram below, show exact relationship of roadways and vehicles at the time of the accident. (Indicate North) Show measurements if possible (identify your vehicle as #1, other vehicles as #2, #3, etc.)



What to do in Case of a Vehicle Accident



DRIVER'S REPORT OF ACCIDENT – PAGE 2

Here is What to do

1. Take precautions necessary to protect the scene of the accident from further accidents.
2. Call police immediately, if someone is injured, request medical assistance. In case of fire, request fire department.
3. If there are any injuries, follow the requirements of the injury, illness, near miss procedure
4. Be courteous. Answer police questions. Give identifying information to the other party involved, but make no comments about assuming responsibility. Check the glove box for insurance information on your rental car.
5. Complete this **ACCIDENT REPORT FORM**. You will need this information later for state and insurance reports.
6. Report the accident to your immediate supervisor as soon as possible. The supervisor will send the completed form to Emil Uglesic in the Oakland Office: phone (510) 285-2718; fax (510) 836-3037. Emil will contact Marsh (the insurance carrier). If the vehicle accident results in an injury to a Geosyntec employee that requires medical attention, the supervisor will notify appropriate personnel within their department and EHS.
7. Take photographs of the damage if it is safe to do so.
8. Do not leave the scene of the accident, until police have arrived or you're being transported by rescue.

Description of Accident

Date _____ Time _____ Oam Opm

Road Condition _____

Time of Day
(check one) ☐ Daylight ☐ Dawn/Dusk ☐ Night

Weather Condition
(check one) ☐ Foggy ☐ Cloudy ☐ Clear

Road Surface
(check one) ☐ Wet ☐ Damp ☐ Dry

Description _____

Driver's Signature _____

Employer
(check one) ☐ Geosyntec Consultants ☐ MMI

Branch Location _____

Branch Phone Number _____

Witnesses

1. Name _____

Address _____

Phone _____

2. Name _____

Address _____

Phone _____

Police Investigation

Name of Officer _____

Report Number _____

Name of Police Agency _____

Was Summons Issued ☐ Yes ☐ No

Injured Persons

1. Name _____ DOB: _____

Address _____

Nature of Injury _____

2. Name _____ DOB: _____

Address _____

Nature of Injury _____

Damage to Property

1. Owner _____

Address _____

Damaged _____

Property _____

Extent of Damage _____

2. Owner _____

Address _____

Damaged _____

Property _____

Extent of Damage _____

MANAGER'S REPORT OF INCIDENT

1. Seek immediate medical attention if the injury/illness is serious and/or life threatening.
2. Employee must report all incidents and near misses to their supervisor immediately
3. Supervisor must immediately notify the EHS Department at (804) 349-8067 or (404) 435-4722 with details of the incident, and discuss appropriate medical care for non-life threatening injury/illness. If unable to contact EHS, employee must call WorkCare at (888) 449-7787 to get assistance with non-life threatening injury/illness care.

EMPLOYEE INFORMATION

Name: _____ Position: _____
 Department #: _____ Employee #: _____ Phone #: _____
 Supervisor Name: _____

FACTS OF INCIDENT

☐ Injury ☐ Illness ☐ General Liability ☐ Near Miss Date and Time of Incident: _____

Date and Time Accident Reported: _____ To Whom: _____

Where did the incident occur (location name and street address)? _____

City: _____ State/Province _____ Zip/Postal Code: _____

County _____ Country: _____

What was the employee doing when the incident occurred? Name the tools, equipment or material the employee was handling and what he was doing with them. _____

Explain how the incident occurred. List events leading up to incident, what happened, how it happened and name objects and how they were involved (use a separate sheet if necessary). _____

NATURE OF INCIDENT

Describe incident and indicate body part affected if injury (e.g. cut on middle left finger). _____

Name object or substance that injured the employee. _____

Has any prior, related injury to affected area of body occurred while employed at Geosyntec/MMI? ☐ Yes ☐ No

MEDICAL ATTENTION GIVEN (check all that apply)

☐ First Aid given by _____ Date/Time _____ Phone _____

☐ Doctor's Name _____ Date/Time _____ Phone _____

Address _____

☐ Hospital Name _____ Date/Time _____ Phone _____

Address _____

☐ Released ☐ Admitted Length of Stay: _____

Did the employee go to an Emergency Room? ☐ Yes ☐ No

EMPLOYEE'S DESCRIPTION OF THE INCIDENT (IN OWN WORDS)

Describe incident and indicate body part affected (e.g. cut on middle left finger) and what you were doing when the incident occurred (be specific) _____

Explain how the incident occurred. List events leading up to incident, what happened, how it happened and name objects and how they were involved (use a separate sheet if necessary). _____

Employee's Signature _____ Date _____

ADDITIONAL INFORMATION (TO BE COMPLETED BY THE MANAGER)

Witnesses

Name: _____ Phone: _____

Name: _____ Phone: _____

What do you believe could be done to help prevent incidents of this type (be specific)? _____

Any additional Comments _____

Manager's Signature _____ Date _____ Phone #: _____

HR/EHS

OSHA Recordable?: ☐ Yes ☐ No ☐ Pending WC? ☐ Yes ☐ No

Days away from work: _____ Days of restricted work activity: _____ Date returned to work _____

HR Manager's Signature _____ Date _____

Comments: _____

EHS Manager's Signature _____ Date _____

Comments: _____

Manager must complete this form within 24 Hours of the incident and fax a copy of this report to Human Resources at (561) 922-1101 and EHS at (804) 332-6732

1.2 Site Workers

A pre-entry briefing conducted by the SHSO must be held prior to initiating the field work of this project. All sections of this HASP must be reviewed during this briefing. Any worker not in attendance at the initial meeting must be trained by the SHSO on the information covered in the pre-entry briefing. Tailgate meetings must be held at the beginning of each day by the SHSO to discuss important health and safety issues concerning tasks to be performed during that shift. Topics discussed in the tailgate meetings must be documented in a daily field log. Weekly Site health and safety audits must be performed and documented by the SHSO for projects lasting more than one week. After reading the HASP and attending a pre-entry briefing, Geosyntec employees must sign the following acknowledgment statement.

“I have read, understand, and agree with the information set forth in this HASP. I have also attended a pre-entry briefing. I agree to perform my work in accordance with this HASP.”

Signature	Printed Name	Date
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

2. DISCLAIMER

This HASP was prepared in accordance with Geosyntec Consultants' Health and Safety Procedures for use by Geosyntec project staff. This plan complies with Geosyntec internal review procedures. Geosyntec does not endorse the use of this HASP by others. This document and its contents should not be used by firms other than Geosyntec or by persons other than Geosyntec employees without a thorough peer review by their health and safety managers. Should the work outlined in this HASP be executed by contractors other than Geosyntec, the HASP should be modified and reviewed to comply with such company's corporate health and safety procedures. In the event that a contractor other than Geosyntec executes this work, the contractor should complete independent analyses of hazards and mitigation measures, and should update all HASP tables, text, figures, and appendices prior to commencing work. Geosyntec assumes no responsibility for the accuracy, content, or health and safety of non-Geosyntec personnel during the implementation of the work in this HASP by other parties.

3. HASP AMENDMENTS

Over the course of this project, it is possible that the project-specific details and working conditions will change. This HASP shall be reviewed and amended as necessary to effectively describe the changing working conditions and to mitigate the potential health and safety issues that may arise during the project. Amendments to the HASP should be briefly described in the following spaces provided. The full text of the amendments should be provided in Appendix A.

AMENDMENT 1:

Date: 04/02/2014

Project Manager: Derek Tomlinson.

EHSC: Ersin Yalcin.

SHSO: As part of vapor intrusion (VI) work, the Site Health and Safety Office (SHSO) will be Jared Brisman.

EPA RPM: Sharon Fang

PADEP: The PADEP Project Officer has changed to Dennis Kutz, 484-250-5784.

Brief description of amendment:

As part of this Site Investigation, VI sampling will be conducted as Task 7. Please see attached THA and refer to Appendix A contained herein for complete Task 7 Descriptions.

AMENDMENT 2:

Date: _____ Project Manager: _____ EHSC: _____

Brief description of amendment:

4. SITE/TASK DESCRIPTION

The following is a brief description of the Site, including information as to the location, approximate size, previous usage, and current usage. A description of the tasks to be performed is also presented.

- Site Location: 92 County Line Road, Colmar, Pennsylvania
- Approximate Size of Site: ~11 acres
- Previous Site Usage: Manufactured parts utilized in automobile hatchbacks, gates, and trunks (gas pistons, shock absorbers, etc.)
- Current Site Usage: Manufacture packaging materials for pharmaceutical, confectionary, beverage, cosmetic, snack food, and other industries.
- Description of Surrounding Property/Population:

North	<u>Agricultural/Commercial</u>	East	<u>Agricultural/Residential</u>
-------	--------------------------------	------	---------------------------------

South	<u>Commercial/Residential</u>	West	<u>Wooded/Residential/Commercial</u>
-------	-------------------------------	------	--------------------------------------

- Summary of previous Site investigations (if available/applicable):

Specific to the Operable Unit 2 (OU2) overburden, elevated levels of volatile organic compounds (VOCs) were detected in the overburden on the former Stabilus property (currently operated by Constantia Colmar) and the former BAE property (currently operated by Sensor Systems) as presented in the Supplemental II RI/FS (USEPA, 2003). The 2003 USEPA investigation identified two areas of observed elevated levels of trichloroethene (TCE) with one near the loading dock of the former Stabilus property and the other located within the former BAE property.

The origins of the TCE near the former Stabilus property loading dock is presumed to be from a spill caused by Baron Blakeslee, Inc., later Honeywell.

Based upon the public record for NP5 and as noted in the USEPA prepared documents including the Responsiveness Summary issued by USEPA, within the Interim ROD in September 2011 (USEPA, 2011), USEPA has not identified a specific source for the elevated levels of TCE in the overburden on the former BAE property. Overburden investigation is expected to provide additional data about the nature and extent of groundwater contamination at OU2, including possible sources.

- Task Descriptions:

Task 1: Site Walk and Siting of Intrusive Investigation Locations

Prior to starting intrusive field activities, Geosyntec will field locate the investigation locations for the OU2 overburden groundwater investigation (Task 4), and the completion of the performance monitoring well network installation activities (Task 5). Locations of intrusive investigation will be field located via a handheld Global Positioning System (GPS) device. Additionally, locations of existing monitoring wells within OU2 will be field located.

Task 2: Oversight of On-site Utility Clearance

Prior to completion of intrusive field activities, the Pennsylvania one-call (811) will be used to Site utilities entering the property. For intrusive locations not within the area of the Pennsylvania one call system, the area will be screened for utilities by a geophysical subcontractor. Geosyntec will oversight the geophysical subcontractor for the on-site utility clearance.

Task 3: Oversight of Clearing and Grubbing (if necessary)

As necessary, Geosyntec will oversee a subcontractor for clearing and grubbing of wooded or overgrown areas that may be necessary in order to perform intrusive activities, or gain access to existing monitoring wells within OU2.

Task 4: Overburden Groundwater Investigation

Geosyntec will coordinate and oversee a drilling subcontractor to perform direct-push drilling for installation of soil borings, collection of groundwater samples, and installation of temporary monitoring wells.

Soil samples will be collected from select locations in the overburden in order to understand the nature and current level of the contamination sources within the subsurface, and the soil characteristics. Soil samples will be collected for both laboratory analytical testing and for use in the EISB treatability study.

Groundwater samples will be collected via direct push in situ groundwater sampling methods via HydroPunch™ or similar method. For locations completed as a soil boring, groundwater samples will be collected from temporary wells. The groundwater samples will be collected in order to delineate the nature and extent of contamination and contaminant sources in overburden groundwater. These samples will be necessary to define the overburden treatment zone and remediation approach. Groundwater samples will be collected for both laboratory analytical testing and for use in the EISB treatability study.

Upon completion of Task 4 and Task 6, Geosyntec will oversee the abandonment of the temporary well points by a PA licensed driller.

Results of the soil and groundwater sampling will be used to design the EISB remedy and the performance monitoring well network.

Task 5: Performance Monitoring Well Network Installation

Geosyntec will oversee a drilling subcontractor to perform the installation of overburden and shallow bedrock monitoring wells via air-rotary drilling techniques. Monitoring well construction will be based on results of the groundwater delineation (Task 4). Redevelopment of select existing overburden and bedrock monitoring wells may be completed as well as part of this task.

For the shallow bedrock wells, the tasks anticipated include oversight of downhole geophysical and packer well testing as well as collection of groundwater samples.

Task 6: Oversight of Surveying Activities

Geosyntec will oversee a land surveying subcontractor to survey in the vertical and horizontal position following the completion of the overburden groundwater and soil sampling locations (Task 4) and will include the existing monitoring well locations within OU2. Geosyntec will again oversee the land surveying subcontractor following the completion of the performance monitoring well network locations (Task 5).

5. KEY PERSONNEL AND HEALTH AND SAFETY RESPONSIBILITIES

Table 1 lists project personnel and their responsibilities in regard to health and safety concerns on this project.

6. WORKER TRAINING

Table 2 presents the training and medical monitoring that project personnel have received in accordance with the company Environmental, Health, and Safety (EH&S) Training Program. Pre-entry briefings and daily tailgate meetings shall also be conducted to facilitate Site-specific training.

7. MAPS AND SITE CONTROL

7.1 Routes to Hospital and Urgent Care Facility

A hospital and an urgent care facility near the Site have been identified. Figure 1A presents the route to the hospital, for emergency care. Figure 1B presents the route to an urgent care facility, for non-emergency care. Both figures also include the facility name, phone number, and written directions from the Site. The figures are included at the front of this HASP.

7.2 Site Map

A Site map is presented on Figure 2, located inside the cover of this HASP. The Site map is intended to show the location of the work zone(s), to provide on-site orientation, and to delineate evacuation routes. Changes may be made to the Site map by the SHSO based on changing Site conditions. The Site map should be accessible in the work area.

7.3 Buddy System

The buddy system is required for all tasks. The buddy system includes maintaining regular contact with onSite Geosyntec personnel, clients, and/or contractors to periodically check on the condition of Site workers. In situations when only one employee is performing field work, on-site personnel must have appropriate communication devices on his/her persons at all times and shall maintain contact with off-site personnel. The field worker must communicate with off-site personnel, at a minimum, of three times daily: (1) upon arriving at the Site; (2) midway through the work day; and (3) upon departing from Site.

7.4 Controlled Work Zones

APPLIES TO TASK: ☐① ☐② ☐③ ☒④ ☒⑤ ☐⑥ ☒⑦ ☐⑧ ☐ Not Applicable

Three controlled work zones, including an Exclusion Zone, a Contaminant Reduction Zone (CRZ), and a Support Zone, are required for the task(s) indicated above. The Exclusion Zone is defined as the area on Site where contamination is suspected and tasks are to be performed. The CRZ is defined as the area where equipment and workers are to be decontaminated as they leave the Exclusion Zone. The Support Zone is defined as the command area and may serve as a staging and storage area for supplies. The location and extent of the work zones may be modified as necessary as Site investigation information becomes available. For Sites that do not require the three controlled work zones, the area(s) where work is to be performed shall be called the Work Zone.

The boundaries of the Exclusion Zone, CRZ, and Support Zone or the Work Zone shall be marked using the following methods:

- | | |
|--|--|
| <input type="checkbox"/> Warning tape | <input checked="" type="checkbox"/> Traffic cones |
| <input type="checkbox"/> Signs | <input checked="" type="checkbox"/> Fence (as needed on former BAE parcel) |
| <input checked="" type="checkbox"/> Other: <u>Caution Tape</u> | |

7.5 Site Access

Access to the Site must be controlled using the following method:

- | | |
|--|---|
| <input checked="" type="checkbox"/> Sign in/Sign out log | <input type="checkbox"/> Guard |
| <input type="checkbox"/> Identification badges | <input type="checkbox"/> Check in with SHSO |
| <input type="checkbox"/> Other: _____ | |

7.6 Visitors

Visitors to the Site may need to be continually escorted for safety purposes. Geosyntec employees must not be allowed into the CRZ or Exclusion Zone or the Work Zone until they have received the proper personal protective equipment (PPE) and they have read, understand, and meet the requirements outlined in this HASP. Other visitors under Geosyntec's direction (subcontractors, etc.) may review this HASP for Site familiarity, but they are ultimately responsible for their own health and safety (see disclaimer in Section 1).

7.7 Safe Work Practices

General Safe Work Practices that must be implemented during work activities at this Site are listed in Table 3.

7.8 Inspections

For projects with field components lasting longer than one week, the SHSO must conduct periodic health and safety inspections. The inspections must be documented using the Health & Safety Inspection Checklist, presented in Appendix B. The Health & Safety Inspection Checklist records should be kept on file at the project Site.

The requirement for periodic inspections is:

- ☐ Not Applicable
☒ Applicable, and the frequency shall be:
 ☐ Weekly
 ☐ Bi-Weekly
☒ Monthly

8. **HAZARD ANALYSIS AND MITIGATORS**

Site specific hazards have been identified through a hazard analysis. Hazard analysis included a review of chemical, physical, and biological hazards. The analysis also identified health and safety hazard mitigators needed to protect workers, which are presented in Appendix C.

8.1 Chemical Hazards

Potential exposure pathways to chemical health hazard agents include inhalation, dermal exposure, and/or ingestion. To effectively manage risk to exposure, constituents of concern (COCs) have been identified. Potential exposure to these COCs will be mitigated through engineering, administrative, and/or PPE controls. The COCs are documented and/or suspected materials present based on previous operations/activities. The identified COCs for this project are listed in Appendix D with appropriate hazard information, including signs of exposure. Hazard Mitigators, which include control measures and methods to minimize exposure, are presented in Appendix C. Also, airborne levels of COCs may be estimated or measured to evaluate levels of PPE that will be required for individual tasks. The type(s) of air monitoring to be performed are discussed in Section 9.

8.2 Physical Hazards

Physical hazards due to the tasks to be performed (e.g., electrocution due to drilling, etc.) and due to the Site setting and condition (e.g., slips, trips, or falls due to rocky terrain, etc.) were analyzed. Hazard mitigators for each physical hazard identified are presented in Appendix C. These hazard mitigators must be implemented for each task in which they are applicable, as summarized in the table in Appendix C.

8.3 Biological Hazards

Biological hazards (e.g., allergic reactions to poisonous plants or insects indigenous to the area, etc.) associated with tasks to be performed were analyzed. Hazard mitigators for each biological hazard identified are presented in Appendix C. These hazard mitigators must be implemented for each task in which they are applicable, as summarized in the table in Appendix C.

9. **AIR MONITORING**

APPLIES TO TASK: ☐① ☐② ☐③ ☒④ ☒⑤ ☐⑥ ☒⑦ ☐⑧ ☐ Not Applicable

Air monitoring will be performed to evaluate airborne exposure levels associated with the COCs on Site within the breathing zone of Site workers. Hazardous conditions may include concentrations that may cause acute or chronic illness, potential oxygen deficient environments, or potential explosive environments. Air monitoring may also be performed to evaluate the adequacy of engineering, administrative, and/or PPE controls. Air monitoring may be “real-time” (e.g., the instrument provides immediate results at the project), using multi-gas meters, photoionization detectors (PIDs), or colorimetric tubes. “Non-real-time” monitoring may also be performed by collecting samples and forwarding to a laboratory for analysis and quantification.

The type(s) of air monitoring equipment required to evaluate COCs is outlined in Appendix E. Monitoring equipment must be calibrated based on the manufacturer’s requirements. Calibration results and air monitoring measurements must be documented. Based on the results noted and Site activities or scope of work changes, the frequency of air monitoring may be adjusted on Site by the SHSO with the consent of the Project Manager and communication with the EHSC.

10. **PERSONAL PROTECTIVE EQUIPMENT**

The levels of PPE required for each task are presented in Appendix F. Required equipment and types of protective clothing materials, as well as an indication of the

initial level of protection to be utilized, are listed. The level of protection may be upgraded or downgraded by the SHSO according to mitigation measures required in Appendix C or according to action guidelines provided in Appendix E. The PPE levels that are implemented must be documented in a daily field log.

If respirators are worn, workers must abide by the company's Respiratory Protection Program in accordance with 29 CFR §1910.134. Table 2 provides a record of the last fit test for each Site worker that may be required to wear a respirator. Fit tests are valid for a period of one year. Persons with facial hair that may interfere with the respirator seal may not wear respirators.

11. DECONTAMINATION

The SHSO and Project Manager will determine the type and level of decontamination procedures for both personnel and equipment based on evaluation of specific work activities in the controlled work zones. In an emergency, the primary concern is to prevent the loss of life or serious injury to personnel. Medical treatment will take precedence over decontamination in the event of a life threatening and/or serious injury/illness. Personnel will perform decontamination in designated and identified areas upon leaving "hot zones" where the potential exists for exposure to hazardous chemical, biological, or environmental conditions.

Decontamination of personnel in Level D (modified) will consist of closure and disposal of coveralls, disposable boots, and gloves, (if applicable).

Decontamination of personnel in Level C, if applicable, will consist, at a minimum, of:

- Removal and cleaning/disposal of boot covers, coveralls, and outer gloves;
- Removal, cleaning, and storage of respiratory protection;
- Washing of boots or other non-disposable PPE (e.g., hard hat, safety glasses/goggles, etc.) suspected of being contaminated using a soap solution followed by a water rinse; and
- Removal and disposal of inner gloves.

Wash solutions and PPE may require disposal at a licensed waste facility. Hand tools and sampling equipment shall be decontaminated as needed by washing in decontamination basins with appropriate solutions, or, if possible, by dry decontamination.

12. EMERGENCY PREPAREDNESS AND RESPONSE

A table presenting a list of contacts and telephone numbers for the applicable local off-site emergency responders is provided inside the front cover of this HASP (after figures). If the nature of the Site work and COCs requires that off-site responders be notified before work begins on this project, the date that the pre-notification was made is presented in the table.

The following emergency response equipment is required for this project:

- ☒ First Aid Kit
- ☒ Fire Extinguisher (Type ABC)
- ☒ Eyewash bottle
- ☐ Other: _____

In the event of an injury to an employee, the Instructions for Injury Response, located in the front of this HASP, must be implemented immediately. ‘Tear-out’ forms are located after the Instructions for Injury Response. If professional medical attention is required, these forms must be provided to the medical provider at the time the medical attention is administered. Injury reporting is required per the procedures presented on the Instructions for Incident Reporting, also located in the front of this HASP.

In the event that an emergency develops, the procedures delineated in the Emergency Response Procedures, located in the front of this HASP, are to be followed immediately. (Note that an emergency does not necessarily include an injury.) After the emergency is resolved, post-incident reporting is required per the procedures presented on the Instructions for Incident Reporting, also located in the front of this HASP.

13. CONFINED SPACE ENTRY

☐ APPLICABLE ☒ NOT APPLICABLE

The task(s) for this project involve confined-space entry. Workers must abide by the company’s Confined Space Entry Program [29 CFR §1910.120(j)].

14. SPILL CONTAINMENT

☒ APPLICABLE ☐ NOT APPLICABLE

The task(s) for this project involve handling of drums and/or containers that contain stored chemicals and/or wastes associated with sampling, excavation, transportation, etc.

Workers must implement the hazard mitigating procedures for drum/container handling presented in Appendix C.

15. CHEMICAL HAZARD COMMUNICATION LABELING

☒ APPLICABLE ☐ NOT APPLICABLE

The following procedures must be followed for chemicals brought onto the Site by Geosyntec personnel (i.e., decontamination solution, sampling preservatives, KB-1 solution, sodium permanganate, etc.) while performing the tasks of this project:

- Labels on primary chemical containers must not be defaced.
- Chemical containers must be stored in appropriate storage containers.
- Secondary containers and storage cabinets must be correctly and clearly labeled using the Hazardous Materials Identification System (HMIS).
- Chemicals incompatible with each other must not be stored together.
- Workers must receive training on the chemical hazards.
- Material Safety Data Sheets (MSDSs) for the chemical must be added to Appendix G.

When chemicals are used on Site, workers must abide by Geosyntec's Hazard Communication Program.

Table 1

Key Personnel and Health & Safety Responsibilities

<i>Project Director</i> Chris Voci	<i>Project Manager (PM)</i> Derek Tomlinson	<i>Site Health & Safety Officer (SHSO)</i> Jared Brisman	<i>Project Personnel</i>	<i>Environmental, Health & Safety Coordinator (EHSC)</i> Scott Douglas
<ul style="list-style-type: none"> • Approve this HASP and amendments, if any. • Verify that elements of this HASP are implemented. 	<ul style="list-style-type: none"> • Approve this HASP and amendments, if any. • Monitor the field logbooks for health and safety work practices employed. • Coordinate with SHSO so that emergency response procedures are implemented. • Verify that corrective actions are implemented. • Verify and document that personnel receive this plan and are aware of its provisions and potential hazards associated with Site operations, and that they are instructed in safe work practices and familiar with emergency response procedures. • Provide for appropriate monitoring, personal protective equipment, and decontamination materials. 	<ul style="list-style-type: none"> • Prepare and implement project HASP and amendments, if any, and report to the Project Manager for action if any deviations from the anticipated conditions exist and authorize the cessation of work if necessary. • Verify that Site personnel meet the training and medical requirements. • Conduct pre-entry briefing and daily tailgate safety meetings. • Verify that all monitoring equipment and personal protective equipment is operating correctly according to manufacturer's instructions and such equipment is utilized by on-site personnel. Calibrate or verify calibration of all monitoring equipment and record results. • Verify that decontamination procedures are being implemented. • Implement Site emergency response and follow-up procedures. • Notify the EHSC in the event an emergency occurs. • Perform weekly inspections. 	<ul style="list-style-type: none"> • Provide verification of required health and safety training and medical surveillance prior to arriving at the Site. • Notify the SHSO of any special medical conditions (e.g., allergies). • Attend pre-entry briefings and daily tailgate safety meetings. • Immediately report any accidents and/or unsafe conditions to the SHSO. • Be familiar with and abide by the HASP. • Be ultimately responsible for his or her own safety. 	<ul style="list-style-type: none"> • Review and audit HASP and amendments. • Maintain a copy of the cover sheet of each completed HASP. • Notify Director of Environment, Health & Safety in the event an emergency occurs. • Assist with the implementation of the corporate health and safety program. • Consult on health and safety issues.

Table 2

Training / Medical Surveillance / Respirator Fit Test Records

	Employee name	Category	Initial 40 Hour	Initial 24 Hour	Annual 8 Hour Refresher	8 Hour Supervisor	CPR	First Aid	Medical Surveillance	Annual Respirator Fit Test	Other
	BRISMAN, JARED		5/22/2009		4/11/2013		1/25/2013	1/25/2013	4/23/2012		
	JACESKO, EMILY		12/15/2006		1/3/2014		9/14/2013	9/14/2013			
	ROWAN, AMY		2/10/2012		4/11/2013	9/19/2013	7/26/2012	7/26/2012	1/31/2012		8/6/2013
	TOMLINSON, DEREK		11/6/1998		4/11/2013	10/24/2000			4/11/2011		
	VOCI, CHRIS		8/6/1992		5/2/2012		3/11/2011	2/17/2010	1/30/2009		

Footnotes:

1 CPR Refresher: every year; First Aid Refresher: every three years.

2 Annual Medical Surveillance for EH&S Category I, Biannual Medical Surveillance for EH&S Categories II & III.

3 For EH&S Categories I & II Only.

Table 3

General Safe Work Practices

- Minimize contact with impacted materials. Do not place equipment on the ground. Do not sit or kneel on potentially contaminated surfaces.
- Smoking, eating, or drinking after entering the work zone and before decontamination is not allowed. Employees who are suspected of being under the influence of illegal drugs or alcohol will be removed from the Site. Workers taking prescribed medication that may cause drowsiness shall not operate heavy equipment and are prohibited from performing tasks where Level C or B personal protective equipment is required.
- Practice good housekeeping. Keep everything orderly and out of potentially harmful situations.
- Use of contact lenses may not be allowed under certain hazardous working conditions.
- The following conditions must be observed when operating a motor vehicle.
 - Wearing of seat belts is mandatory
 - The use of headlights is mandatory during periods of rain, fog, or other adverse weather conditions
 - A backup warning system or use of vehicle horn is mandatory when the vehicle is engaged in a backward motion
 - All posted traffic signs and directions from flagmen must be observed
 - Equipment and/or samples transported in vehicles must be secured from movement
 - The use of vehicles acquired by Geosyntec by non-Geosyntec personnel is prohibited
- In an unknown situation, always assume the worst reasonable conditions
- Be observant of your immediate surroundings and the surroundings of others. It is a team effort to notice and warn of dangerous situations. Withdrawal from a hazardous situation to reassess procedures is the preferred course of action.
- Conflicting situations may arise concerning safety requirements and working conditions. These must be addressed and resolved rapidly by the SHSO and PM to relieve any motivations or pressures to circumvent established safety policies.
- Unauthorized breaches of specified safety protocol must not be allowed. Workers unwilling or unable to comply with the established procedures must be discharged.

Appendix A

HASP Amendments

Discuss details of amendments to this HASP here. Include amendment number, date, and details of amendments.

AMENDMENT 1:

Date: 04/02/14

Project Manager: Derek Tomlinson

EHSC: Ersin Yalcin

SHSO: As part of vapor intrusion (VI) work, the EHSC will be Jared Brisman.

EPA RPM: Sharon Fang

PADEP: The PADEP Project Officer has changed to Dennis Kutz, 484-250-5784.

Details of Amendment:

Task 7 Description:

Task 7.1: Completion of Building Survey

Prior to starting intrusive field activities, Geosyntec will conduct a building survey with the Site contact, Richard Klecker, to determine: 1.) Locations of chemical storage, including cleaning products and compounds used on Site; 2.) Locations of possible vapor intrusion (VI) pathways (such as doors or windows); and 3.) Locations for sub-slab soil gas sampling points (see Task 7.3 below).

Task 7.2: Oversight of On-site Utility Clearance

Prior to completion of intrusive field activities, the Pennsylvania one-call (811) will be used to site utilities entering the property. For intrusive locations not within the area of the Pennsylvania one call system, Geosyntec will rely on and defer to Constania-Colmar, Inc. to provide the location of the utilities beneath the slab.

Task 7.3: Sub-Slab Soil Gas Sampling

Geosyntec will conduct sub-slab soil gas sampling at six sample locations within the Facility on Site, with locations determined during Task 7.1, above. Under Task 7.3 Geosyntec will drill a ½" diameter hole through the concrete floor slab of the Facility, through which a brass fitting will be installed and sealed with a non-VOC sealer. Sampling tubing will be attached to the fitting and a 1L-sized Summa canister will be used to obtain VI samples. The sampling locations will be cleaned of debris and the brass fittings will remain in place. Sampling methodology will follow USEPA standard procedures as detailed within the Field Sampling Plan (FSP) within the Response Action Plan (RAP) dated 2 April 2014.

Appendix B

Health & Safety Inspection Checklist

Project: _____ Date: _____	
Inspected by: _____	
<i>Category</i>	<i>Observations/Corrective Actions (N/A, if Not Applicable)</i>
Pre-entry briefing records are current	
Tailgate meeting records are current	
Training/medical surveillance/respiratory protection records are current	
Site map is posted	
Buddy system is implemented	
Work zones are identified	
Site access is controlled	
Visitors are being escorted	
On-site/off-site communications are in working order	
Safe work practices are being implemented	
Any additional hazards incurred?	
Air monitoring equipment is in working condition	
Air monitoring records are being recorded in field logbook	
Air monitoring calibration records are being recorded in field logbook	
PPE storage area is neat and organized	
Standard operating procedures are being implemented	
Housekeeping at decontamination zone is appropriate	
Decontamination procedures are being implemented	
Emergency response equipment is in working condition	
Route to hospital is posted	
Confined space entry program is being implemented	
Spill containment equipment is available	
Chemical inventory is up to date	
Material safety data sheets are available	
Primary and secondary containers are properly labeled	
Housekeeping at the chemical storage area is appropriate	

Appendix C

Hazard Analysis and Hazard Mitigators

TASKS	
① Site Walk / Siting of Intrusive Investigation Locations	⑤ Performance Monitoring Well Network Installation
② Oversight of On-site Utility Clearance	⑥ Oversight of Surveying Activities
③ Oversight of Clearing and Grubbing (if necessary)	⑦ Vapor Intrusion Assessment
④ Overburden Groundwater Investigation	⑧

TASK #	①	②	③	④	⑤	⑥	⑦	⑧
I. Chemical Hazards								
Fire			X	X	X			
Permanganate Handling								
Reactivity								
Skin absorption				X	X			
II. Physical Hazards								
Bioaugmentation Culture Handling								
Boating								
Chainsaw			X					
Cold Stress	X	X	X	X	X	X	X	
Compressed Gas Cylinder				X	X		X	
Downhole Logging					X			
Drilling (including Indoor)				X	X		X	
Drum and Container Handling				X	X			
Electrocution								
Excavation/Trenching								
Eye Injury			X	X	X		X	
Fall Protection								
Flash Flood								
Hand/Foot Injury	X	X	X	X	X	X	X	
Heat Stress	X	X	X	X	X	X	X	
Heavy Equipment			X	X	X		X	

TASK #	①	②	③	④	⑤	⑥	⑦	⑧
Helicopter								
Knives / Blades			X	X	X		X	
Lifting Heavy Loads			X	X	X		X	
Lockout/Tagout								
Loud Noise			X	X	X		X	
Nuclear Gauge Radiation Exposure								
Portable Power/Hand Tool			X	X	X		X	
Slips, Trips, and Falls	X	X	X	X	X	X	X	
Thoroughfares	X	X	X	X	X	X	X	
Truck Crane								
Urban Environments								
Utility Protection			X	X	X			
Welding and Cutting				X	X			
Other:								
III. Biological Hazards								
Allergic Reaction to Poisonous Plants	X	X	X	X	X	X		
Alligators								
Dogs								
Stinging Insects / Vermin / Snakes	X	X	X	X	X	X		
Medical Waste								
Mountain Lions								
Other:								

An X in a box indicates that the listed hazard is applicable to the respective task. The appropriate Hazard Mitigators are presented in this Appendix.

FIRE

- Know fire prevention procedures, fire-fighting techniques and essential precautions to prevent injury.
- Do not stop to get anything out of a building or area if evacuation is required. JUST GET OUT - and assemble in the predetermined evacuation assembly points.
- There are 3 elements to starting a fire: a fuel source, an oxygen source and a point of ignition.
- Know how and when to use different types of fire extinguishers.
- Keep all fire extinguishers in workable condition and accessible at all times. Access to or visibility of extinguishers shall not be obstructed.
- Control static electricity (e.g., ground equipment)
- Remove only the minimum required supply of paints, solvents, or other flammables from storage. At no time shall the quantity removed exceed one day's working supply.
- Do not allow combustible products of rubbish, waste or other residues to accumulate. Oil soaked rags and material subject to spontaneous combustion shall only be stored in non-combustible containers with self-closing lids.
- Do not store gasoline, flammable solvents, and liquids inside a building unless the structure has been approved for flammable storage containers. Only OSHA-approved storage cabinets shall be used for all flammable liquids, paints or solvents.
- Flammable liquids shall be stored in locations that will not interfere with evacuation of the area in case of a fire.
- Do not permit smoking, striking of matches, or other sources of ignition outside of designated "SMOKING" areas.
- Discard cigarette butts, matches or other similar materials in non-combustible containers.

SKIN ABSORPTION

- Be aware of chemicals of concern that can directly injure (corrode, burn, dehydrate) the skin or that can be absorbed into the bloodstream and subsequently transported to other organs from dust, liquid or vapor sources.
- Know that skin absorption is enhanced by abrasions, cuts, heat, and moisture.
- Do not wear contact lenses in contaminated atmospheres (since they may trap chemicals against the eye surface). The eye is particularly vulnerable because airborne chemicals can dissolve in its moist surface and be carried to the rest of the body through the bloodstream (capillaries are very close to the surface of the eye).
- Keep hands away from face.

The task(s) for which these Hazard Mitigators apply are presented in the Appendix C Directory

- Minimize contact with liquid and solid chemicals.
- Wear protective clothing (e.g., suits and gloves) as specified by the Site Specific Health and Safety Plan.

COLD STRESS

- Work in pairs to keep an eye on each other and watch for signs of cold stress.
- Wear layers of loose fitting clothing, including insulated coveralls, head covering, gloves and boots.
- Minimize wind chill effects by wearing a wind resistant outer shell.
- Minimize lengthy periods of outdoor activity. This may require additional shifts and taking frequent breaks to warm up.
- Provide warm shelter.
- Remain hydrated. There is a tendency not to drink as many fluids when temperature is cold.
- Be aware of the symptoms of cold stress and appropriate first aid measures. Because of the considerable danger to personnel, outdoor work should be suspended if the ambient temperature drops below 0°F or if the wind chill factor drops below -29°F.

Signs and symptoms:

Mild hypothermia

Shivering, lack of coordination, stumbling, fumbling hands, slurred speech, memory loss, pale and cold skin.

Moderate hypothermia

Shivering stops, unable to walk or stand, confused and irrational.

Severe hypothermia

Severe muscle stiffness, very sleepy or unconscious, ice cold skin.

Treatment:

Mild hypothermia

Move to warm area, stay active, remove wet clothes and replace with dry clothes or blankets, cover the head, drink warm (not hot) sugary drink.

Moderate hypothermia

Call for an ambulance, cover all extremities completely, Place very warm objects, such as hot packs or water bottles on the victim's head, neck, chest and groin and follow treatments for mild hypothermia.

Severe hypothermia

Call for an ambulance, treat the victim very gently, cover all extremities completely.

COMPRESSED GAS CYLINDER

- Keep cylinder valve caps screwed on at all times when regulators and gauges are not attached to the cylinder and when the cylinder is being moved.
- Do not use force to remove valve cap if stuck.
- Protect cylinders from cuts and abrasions.
- Use extreme care not to drop cylinders.
- Secure cylinders in an upright position using chains or other approved restraints.
- Do not use cylinders for rollers or support.
- Do not tamper with cylinder valves or safety devices.
- Do not lift cylinders using the protective valve caps.
- Do not substitute oxygen for compressed air.
- Store all oxygen cylinders at least 20 feet from all fuel gas cylinders and gasoline or diesel storage tanks.
- Keep cylinders away from exposure to open flame.
- Do not use oil or grease on oxygen cylinders or regulator connections to avoid an explosion.
- All cylinders must be labeled and indicate when they have been emptied.
- Check all valves and fittings on a cylinder for leaks with each use. If leakage is found, place a tag on the cylinder indicting the defect, and report it to the SHSO.
- Leak test all connections using soap solution where possible.
- Be certain that the second stage of the regulator is closed, after attaching the regulator to the cylinder, but before opening the cylinder valve.
- Stand to one side of the regulator gauge while you slowly open the cylinder valve 1/4 of a turn.
- Keep wrench on the valve stem of an acetylene cylinder when in use.
- Close the cylinder valve and bleed the pressure off hoses on cylinders when not in use.
- Use a cylinder cart to transport cylinders distances greater than 2 feet.

DOWNHOLE LOGGING

- All members of the drilling crew shall be trained in the safety features and procedures to be utilized during operation, inspection, and maintenance of the equipment.
- Set up equipment on stable ground. Cribbing (a system of timbers, arranged in a rectangular pattern, used to support and distribute the weight of the equipment) shall be used when necessary.

The task(s) for which these Hazard Mitigators apply are presented in the Appendix C Directory

- Potentially unsafe shafts SHALL NOT be entered.
- A cage with a solid plate on top shall always be used when downhole logging. Wear hard hats, steel-toed boots, and eye protection at all times in case of falling debris.
- Be sure equipment (including the cage and lights) are in good working condition and the hoist line is free of rust/wear before lowering the downhole logger.
- The boring is a confined space. The Geosyntec Confined Space Entry Program must be followed strictly.
- Prior to entry into a shaft, air monitoring shall be conducted to ensure that the shaft does not contain dangerous air contamination or an oxygen deficiency. This monitoring shall continue for the duration of the logging.
- Be sure the air line is operational before beginning downhole logging work (if required). If supplied air is used it must be certified for breathing use purposes.
- The downhole logger shall wear a full safety harness at all times when performing logging activities and shall be tethered directly to the hoist line, separate from the cage.
- A 12-inch to 18-inch diameter steel cone-shaped headguard/deflector will be attached to the hoist cable above the harness.
- Workers will be in continuous verbal contact with the downhole logger to provide surveillance of his/her conditions while logging is carried out. Any sign of changes in verbal communication of the logger, he/she will immediately be lifted to the surface.
- All wells, shafts, caissons, etc shall be barricaded or securely covered when not in use.
- Surface personnel should keep back from the mouth of the boring to prevent rocks and other debris from falling into the hole.
- Monitor weather conditions. Operations shall cease during electrical storms or when electrical storms are imminent.

DRILLING (Including Indoor)

- All members of the drilling crews shall be trained in the standard operating safety features and procedures to be utilized during operation, inspection, and maintenance of the equipment.
- Wear hard hats, steel toed boots, hearing protection and safety glasses at all times when performing drilling operations.
- Conduct a survey, prior to bringing drilling equipment to the job Site, to identify overhead electrical hazards, potential subsurface hazards, and terrain hazard. Once on Site, before drilling equipment is moved, the travel route shall again be visually surveyed for overhead and terrain hazards. Document possible hazards and communicate them to the drilling crew.

The task(s) for which these Hazard Mitigators apply are presented in the Appendix C Directory

- Use only drilling equipment equipped with two easily-accessible emergency shutdown devices, one for the operator and one for the helper. Shutdown devices should be tested at the beginning of each day.
- Do not transport drilling equipment with the mast in the upward position.
- Extend outriggers per the manufacturer's specifications.
- Monitor weather conditions. Operations shall cease during electrical storms or when electrical storms are imminent.
- Wearing of loose clothing (e.g., open shirts, hooded sweatshirts, etc) is not permitted.
- When appropriate use auger guides on hard surfaces.
- Verbally alert employees and visually ensure employees are clear from dangerous parts of equipment prior to starting or engaging equipment.
- Channel the discharge of drilling fluids away from the work area to prevent the ponding of water.
- Use hoists only for their designed intent. Hoists shall not be loaded beyond their rated capacity. Steps shall be taken to prevent two-blocking of hoists (the condition when the lower load block or hook assembly comes in contact with the upper load block, or when the load block comes in contact with the boom tip). Follow the equipment manufacturer's procedures if ropes become caught in, or objects are pulled into a cathead.
- Do not run or rotate drill rods through rod slipping devices. No more than 5 feet of drill rod column shall be hoisted above the top of the drill mast. Drill rod tool joints shall not be made up, tightened, or loosened while the rod column is supported by a rod slipping device.
- Control dust using dust suppression techniques.
- Clean augers, drill casing, or drill rod only when the rotating mechanism is in neutral and the pipe is stationary is stopped.
- Cap and flag open boreholes; open excavations shall be barricaded.
- Keep all hand tools used during drilling operations clean and in good working condition.
- Check fire extinguishers and notify all onSite personnel to their whereabouts.
- Check cables for frays and hydraulic hoses for leaks daily.
- In situations where ambient water level may be above top of well screen, during well construction, ensure that well casing is vented to prevent air pressure build-up in blank casing above screen.

Indoor Drilling

- Conduct a survey, prior to bringing drilling equipment to the job Site, to identify ceiling height, overhead hazards, potential subsurface hazards, terrain hazard, and building

stability particularly during drilling activities. Identify sources of ventilation (including open doorways for cross ventilation and fans to assist in air flow). Once on Site, before drilling equipment is moved, the travel route shall again be visually surveyed for overhead and terrain hazards and avenues of ventilation will be opened or turned on.

- Notify and/or evacuate all building occupants prior to start of drilling activities.
- All drilling rig exhaust will be redirected outdoors by tubing. The perimeter of the outdoor exhaust area shall be roped off a suitable distance to allow proper ventilation of exhaust.
- Monitor ambient oxygen percentage and carbon monoxide concentrations in the work zone, as well as entire indoor area, to prevent low oxygen or high carbon monoxide environments. Operations shall cease and the building will be evacuated if levels become dangerous.

DRUM AND CONTAINER HANDLING

- Only trained personnel should open drums containing unknown materials.
- Bulging drums or containers are an indication of pressure build-up. Open all drums or bungs extremely slowly to determine the presence of vapors or pressure inside the drum. If the possibility of fire or explosion exists, a protective shield should be used and/or remote opening devices. Employees not directly involved with opening a container shall be kept a safe distance away.
- Use only drums and containers that meet the appropriate DOT, OSHA, and EPA regulations.
- Utilize drum/container handling equipment whenever possible. The equipment should have a sufficiently rated load capacity and should be able to operate smoothly on the available surface.
- Label and identify drums and containers when moved to the staging areas to safely identify and classify their contents. Segregate incompatible drums.
- Inspect the integrity of the drum container before moving. Any drum or container lacking integrity shall be placed within an over pack container.
- Staging areas require adequate escape routes. Staging area should provide secondary containment for all moved drums.
- Employees must be warned of the potential hazards associated with the contents of containers or drums prior to moving said containers or drums.
- Organize Site operation to minimize the amount of drum or container movement. Have a clear view of the available pathway when moving drums. If needed, an additional person should be available to provide guidance.
- Never stand on drums or containers.
- Use non-sparking tools and appropriate grounding and bonding equipment.

The task(s) for which these Hazard Mitigators apply are presented in the Appendix C Directory

- Appropriate fire extinguishing equipment must be onSite at all times during drum handling.
- Spill control equipment shall be onSite in areas where spills ruptures or leaks may occur.

EYE INJURY

- Wear appropriate eye protection according to the task at hand.

HAZARD	TYPE OF PROTECTION
Impact	Safety glasses with side shield or vented safety goggles
Heat (Sparks)	Vented safety goggles or safety glasses with a face shield
Chemical	Hooded vented safety goggles or full-face respirator (if mild chemicals then safety glasses with side shield is acceptable)
Light Radiation	Tinted/reflective safety glasses or tinted/reflective face shield
Dust	Hooded vented safety goggles

- Apply anti-fog product to lens not previously treated.
- Minimize the amount of vapor or particulate matter generated, if possible.
- Avoid touching the face and eyes.
- Flush eyes with water for at least 15 minutes if chemicals do get into the eyes. If condition persists, seek medical attention.
- If dust or foreign objects are in your eyes, do not rub your eyes.
- If an object becomes embedded in the eye, do not attempt to remove. Lightly bandage your eyes, or both eyes, if possible and immediately seek medical attention.
- Do not wear contact lenses if chemical or dust hazard is present (e.g. decontamination or preservation chemicals used during sampling).
- Provide on-site training to workers before tasks at hand.
- If visitors enter area, stop work until they are properly protected.

HAND/FOOT INJURY

- Wear protective gloves as required in the Health and Safety Plan. Gloves should be chosen to suit the work being performed (e.g., chemical resistant gloves will be worn when handling chemicals or sampling for suspected chemicals).
- Steel-toed/steel-shanked safety boots must be worn whenever working around heavy objects (or as required by the HASP). Insulated and/or waterproof boots may also be warranted depending on weather conditions. Boots should be inspected periodically for signs of wear (e.g., cracks in rubber or along soles) and replaced as required.
- Durable footwear which provides adequate ankle support should be worn when working in rugged terrain.
- Use proper lifting techniques to avoid dropping heavy loads on hands and feet (refer to lifting heavy loads hazard mitigator)
- Be aware of moving machinery and heavy equipment in the work area and tuck away any loose clothing.

HEAT STRESS

Prevention:

- Drink plenty of hydrating fluids, such as Gatorade® or water. In high heat, a minimum of one gallon per day should be consumed. Fluid should be consumed frequently. Don't wait until thirsty.
- Provide cooling devices, when necessary, to aid natural body heat exchange during prolonged work or severe heat exposure. Devices include field showers, hose-down areas, shade umbrellas/tents, wide-brim hats, and cooling jackets, vests, or suits.
- If amenable to work conditions, wear light-colored, loose fitting, "breathable" clothing.
- Avoid prolonged periods of exposure. Take breaks as necessary. Higher heat exposure requires more frequent breaks.
- Be able to recognize the signs, symptoms and how to treat for heat stress. Signs, symptoms and treatment are listed below.

Signs and Symptoms:

- Mild heat stress - Decreased energy, slight loss of appetite, nausea, lightheadedness.
- Moderate heat stress - heavy sweating, thirst, faintness, headache, confusion.
- Severe heat stress (heat stroke) - Throbbing headache, confusion, irritability, rapid heartbeat, difficulty breathing, dry skin (no sweating), vomiting, diarrhea.

Treatment:

- Mild and Moderate heat stress - Take to cool place, drink cool (not cold) fluids, remove excess clothing, rest.

The task(s) for which these Hazard Mitigators apply are presented in the Appendix C Directory

- Severe heat stress - Call 911 for an ambulance and get to a cool place, remove excess clothing and rest.
- Adjust work and rest schedules as needed. Establish a work regimen that will provide adequate rest periods for cooling down. This may require additional shifts of workers.
- Provide shelter or shaded areas (77°F is best) to protect personnel during rest periods.
- Maintain worker's body fluids at normal levels to ensure that the cardiovascular system functions adequately. Daily fluid intake must equal the approximate amount of water lost in sweat. Workers are encouraged to drink more than the amount required to satisfy thirst (recommend water and sport drinks, not coffee or soda), because thirst is not an adequate indicator of adequate salt and fluid replacement.
- Remove impermeable protective garments during rest periods.
- Do not assign other tasks to personnel during rest periods.

HEAVY EQUIPMENT

Working around Heavy Equipment

- Yield to heavy equipment.
- Listen for warning signals on heavy equipment.
- Perform a visual inspection and walk around parked heavy equipment before moving to assure that equipment is in good condition and that there are no personnel on the ground that could be injured or objects that could be damaged by vehicle movement.
- Wear hearing protection if required.
- Wear traffic vests for increased visibility.
- Maintain eye contact with the heavy equipment operator when working near equipment.
- Be aware of changes in sound of equipment which may indicate a change in direction.

Heavy Equipment Operators

- Use hand rails and footholds when mounting and dismounting equipment,
- Brakes, steering, clutches and controls shall be tested.
- Pay attention to workers on the ground who may be in the path and provide warning prior to moving the equipment.
- Permit no one to ride on, or in, heavy equipment. This includes any portion of a backhoe, bulldozer, forklift or the back of a pickup truck, except in locations specifically designed for passenger use and approved by the SHSO.
- Keep haulage vehicles under positive control at all times while operating. Vehicles shall be kept in gear when descending grades.

The task(s) for which these Hazard Mitigators apply are presented in the Appendix C Directory

- Do not use heavy equipment on slopes with steepness exceeding 3H:1V unless operations are consistent with manufacturer's recommendations (if the Owner's Manual is not with the equipment or does not specify slope operating procedures, see the SHSO).
- Operate equipment with booms, blades, buckets, beds, etc., lowered or in a stable position while on slopes. Safety cables tethered to appropriate anchors shall be used for equipment working on steep slopes, where appropriate.
- Suspend in slings or support by hoists or jacks heavy equipment in need of repair. The equipment must also be blocked or cribbed before working underneath.
- Shut off motors, do not allow smoking, and use proper dispensing equipment when refueling gasoline-operated equipment to prevent fire hazards.
- Lower hydraulic systems (e.g., blades, etc.) to the ground, set brakes, and shut down equipment if malfunction occurs.
- Use rollover protection and seat belts.

KNIVES / BLADES

- Always wear proper protective equipment. This should include:
 - heavy-duty leather gloves,
 - steel-toed boots with non-slip soles, and
 - hardhat and eye protection.
- Check the work area and make sure that:
 - the ground is free of obstacles such as rocks, stumps, holes, and wet or otherwise slippery conditions.
 - you can get a firm footing on the ground.
- Route cords, hoses, and cables supplying power to portable power tools to prevent tripping hazards.
- Protect tools from corrosion damage.
- Keep tools free of accumulated dirt and unnecessary oil or grease.
- Worn, damaged or dull blades should be sharpened or replaced as necessary.

LIFTING HEAVY LOADS

- Proper lifting techniques include:
 - *Feet* - Feet should be parted, with one foot alongside the object being lifted and one behind. Feet should be comfortably spread to give greater stability. The rear foot should be in position for the upward thrust of the lift.

- *Back* - Use the sit-down position and keep the back straight, but remember that “straight” does not mean “vertical”. A straight back keeps the spine, back muscles, and organs of the body in correct alignment. It minimizes the compression of the abdomen that can cause a hernia.
- *Arms and Elbows* - The load should be drawn close to the body, and the arms and elbows should be tucked in. When the arms are held away from the body, they lose much of their strength and power. Keeping the arms tucked in also helps keep body weight centered.
- *Palm* - The palm grip is one of the most important elements of lifting. The fingers and the hand are extended around the object to be lifted. Use the full palm; fingers alone have very little power.
- *Chin* - Tuck in the chin so the neck and head continue the straight back line. Keep the spine straight and firm.
- *Body Weight* - Position the body so its weight is centered over the feet. This provides a more powerful line of thrust and assures better balance. Start the lift with a thrust of the rear foot. Shift hand positions so the object can be boosted after knees are bent. Straighten knees as object is lifted or shifted to the shoulders. To change direction, lift the object to a carrying position, and turn the entire body, including the feet. Do not twist your body. In repetitive work, both the person and the material should be positioned so that the worker will not have to twist his body when moving the material. If the object is too heavy to be handled by one person, get help.
- Limit continuous lifting of weights to 50 pounds or the maximum allowed by the client whichever is less. Lifts of heavier weights are permitted on an interim basis. Help shall be obtained for lifting of loads greater than 50 pounds or the maximum allowed by the client whichever is less. Mechanical equipment should be used on heavy materials when possible. If mechanical assistance is not available, adequate manpower to maintain the 50-pound limit per employee will be required.
- Do not lift more weight than can be handled comfortably, regardless of load weight. If necessary, help should be requested to lift a load so that the lifting is comfortable.
- Use drum dollies when moving drums or barrels.
- Inspect objects for grease or slippery substances before they are lifted to ensure that the object will not slip.
- Do not carry long, bulky or heavy objects without first verifying that the way is clear and that vision is unobstructed. This ensures that other persons or objects will not be struck by the load.
- Do not carry loads that cannot be seen over or around.
- Exercise caution when lifting above the chest level.

- Make sure workers are physically suited for the job before assigning jobs requiring heavy and/or frequent lifting. A person's lifting ability is not necessarily indicated by his height or weight.
- Before lifting an object, consideration should be given to how the object will be set down without pinching or crushing hands or fingers. For example, to place an object on a bench or table, the object should be set on the edge and pushed far enough onto the support so it will not fall. The object can then be released gradually as it is set down, and pushed in place with the hands and body from in front of the object.
- When two or more people are handling the same object, one should "call the signals". All the persons on the lift should know who this person is and should warn him if anyone in the crew is about to relax his grip.

LOUD NOISE

- Wear hearing protection in areas with constant or loud noise.
- Know the effects of noise, including:
 - Workers being startled, annoyed, or distracted.
 - Physical damage to the ear, pain, and temporary and/or permanent hearing loss.
 - Communication interference that may increase potential hazards due to the inability to warn of danger and proper safety precautions to be taken.
- Implement the company Hearing Conservation Program when noise exposures equal or exceed an 8-hour, time-weighted average (TWA) sound level of 85 decibels on the A-weighted scale (dB).
- Utilize feasible administrative or engineering controls if workers are subjected to noise exceeding an 8-hour TWA sound level of 90 dB.

SLIPS, TRIPS, AND FALLS

- Wear the proper foot wear and clothing for the task at hand.
- Pay attention to the work environment and become aware of all equipment and vehicles active onSite and use caution when moving about.
- Use caution when walking on sloped areas (especially geosynthetics), particularly when moisture is present. Use caution when walking on soft or uneven surfaces; e.g., marsh areas. Watch for icy conditions in cold weather.
- Follow the established designated safe paths for travel and keep these areas free from debris. Avoid steep or slippery slopes and paths near operation vehicles and equipment.
- Follow good housekeeping procedures. Never assume that someone else will clean up a spill or put away an object.
- Remove or clearly mark objects that pose tripping hazards.

The task(s) for which these Hazard Mitigators apply are presented in the Appendix C Directory

- Prevent water accumulation where practicable.
- Cables and/or wiring should be taped down, when possible. Locate cables and/or wiring out of the commonly used areas.
- Mark or repair any opening or hole in the floor.
- Carry objects in a manner that allows you to see in the area you are moving in. Do not carry objects that are too large or bulky. Do not carry more weight than you can balance and keep stable. Understand that PPE can reduce or limit your field of vision and mobility.
- Use the proper ladder for the task at hand and do not exceed the recommended height. Do not use the top two rungs of a ladder. Ensure a flat and stable footing for the placement of a ladder. Utilize the buddy system to help secure the ladder. When working over 6 ft., utilize fall prevention measures. Obey height and weight guidelines and/or rules.
- Use the handrail when using stairs. Be aware of stairway blockages.
- If conditions even slightly resemble an unsafe environment, do not make any assumptions that the integrity of a workplace is intact.
- Never jump over or into a trench or excavation.
- Walk, do not run.
- Maintain proper lighting so obstacles are clearly visible

THOROUGHFARES

- Obtain necessary permits to use/block public thoroughfares.
- All care should be taken to ensure the integrity of walking and working surfaces, including the use of barriers, toe-kicks, etc. to warn personnel and the public of the potential fall and tripping hazards. Guardrails or barrier walls should be constructed surrounding open pits and trenches as appropriate.
- Traffic control plans will be produced and followed when required by the permitting agency or when working on or adjacent to a highway or a busy street. The traffic control plan shall be brought to the Site and shall delineate the locations of applicable signs, signals and barricades; describe the necessity for flaggers; and provide other traffic control information..
- Signaling equipment and directions by flaggers shall conform to the latest edition of the U.S. Department of Transportation – Federal Highway Administration, Manual on Uniform Traffic Control Devices for Streets and Highways (<http://mutcd.fhwa.dot.gov>).
- Flaggers shall be provided with and shall wear fluorescent orange-red or fluorescent yellow-green garments while flagging. Warning garments worn at night shall be made of reflective material. The garments should meet the requirements of ISEA, American National Standard for High-Visibility Apparel.

- Barricades for protection of employees shall conform to the portions of the latest edition of the U.S. Department of Transportation – Federal Highway Administration,, Manual on Uniform Traffic Control Devices for Street and Highways (<http://mutcd.fhwa.dot.gov>), relating to barricades.

UTILITY PROTECTION

The occurrence of above and below-ground utilities should be anticipated at every Site. The traditional method of using existing “as built” plans and maps (if available) and probing in the field (i.e., “hunt and hope”) is not sufficient to provide adequate assurance that utilities are not impacted during Site activities. Geosyntec developed this Utility Protection Hazard Mitigator to implement prior to conducting intrusive Site activities (i.e., drilling, well installation, trenching, excavation, hand auguring, etc.). The objective of the Utility Protection Hazard Mitigator is to describe the process necessary to investigate, and to the extent practical, identify utilities in work areas for the purpose of avoiding the utilities, protecting utilities and Site personnel, and mitigating impacts to Site operations.

Approximate location of subsurface installation means a strip of land not more than 24-inches on either side of the exterior surface of the subsurface installation.

Excavation means any operation in which earth, rock, or other material in the ground is moved, removed, or otherwise displaced by means of tools, equipment, or explosives in any of the following ways: grading, trenching, digging, ditching, drilling, auguring, tunneling, scraping, cable or pipe plowing and driving, or any other way.

High priority subsurface installation means high-pressure natural gas pipelines with normal operating pressures greater than 415 kPa gauge (60 psig) or greater than six inches nominal pipe diameter, petroleum pipelines, pressurized sewage pipelines, high-voltage electric supply lines, conductors, or cables that have a potential to ground of greater than or equal to 60 kilovolt (kV), or hazardous materials pipelines that are potentially hazardous to workers or the public if damaged.

The Mitigator process is summarized below:

- Identify the location of the planned intrusive activities.
- Mark the planned work area with white water based marking paint. If work area is not visible from the street either because of obstruction or distance, provide distance from street to work area (i.e., 150 feet north).
- Contact DigAlert or dial 811 (nationwide) to identify utilities in your work area. <http://www.digalert.org/> (811) provides a link to the local state operated “Call-Before-You-Dig” service.
- Review existing utility maps with facility personnel and determine the approximate numbers and types of utilities within the project area. This is inclusive of below-ground utilities that may be encountered during intrusive operations as well as overhead utilities that may be encountered during operations (i.e., drilling mast and overhead power lines).
- Most “Call-Before-You-Dig” services will only mark below-ground utilities leading to the Site utility meter. With the exception of high priority utilities (as defined above), utilities present after passing through the Site meter may be left without adequate

inspection. In such cases, the use of a private utility location firm may be prudent to ensure thorough identification of utilities.

- Retain the services of a private utility locating company that can identify metallic utilities and anomalies in the vicinity of the work area. Private utility location firms use a variety of location techniques. The suspected types of utilities should be discussed with the private utility location firm to ensure that proper techniques are used. Improper techniques may result in missed or improperly identified utilities.
- DigAlert must be called at least 48 hours prior to the start of work to complete a utility inspection. (For example, if you notify DigAlert on Tuesday at 9:43 a.m. no work can begin until Thursday at 9:43 a.m.)
- Record the inspection confirmation number. Confirm that the inspection was conducted prior to the start of work. The inspection confirmation number is critical in the event that an unmarked utility is encountered, or if a utility identified during the inspection request did not mark the Site for the presence or absence of the utility (no-show). If a no-show occurs with it may be possible that the utility operator sent a facsimile care of the project manager (identified during utility inspection request) indicating that there are no conflicts in the planned work area. However, if there is any question, contact DigAlert immediately and request that the missing utility please call to confirm presence or absence of utility in work area or schedule a meeting time at the Site.
- After below-ground utilities are identified, the utilities should be marked. The most common marking method is paint or pin flags. The following marking colors are generally widely accepted to demarcate specific types of utilities, but should be confirmed.

RED	ELECTRIC
YELLOW	GAS, OIL, STEAM
ORANGE	COMMUNICATIONS
BLUE	POTABLE WATER
PURPLE	RECLAIMED WATER
GREEN	SEWER / DRAINAGE
PINK	SURVEY MARKS
WHITE	PROPOSED EXCAVATION

- Above-ground utilities should be visually identified. Warning signs may be placed in work areas to remind workers of the above-ground utilities. Other techniques such as shielding or utility relocation may be necessary to make the work safe. Proper set back and approach distances must be maintained at all times.
- Be observant of above-ground features at a Site that may be indicative of an underground utility line. An example of this would be noticing two fire hydrants and

noting that there is likely a buried water line between them, signs of trenching activities, asphalt or concrete patches, or linear depressions in the ground surface.

- Following the completion of the utility marking, the work area should be inspected by all members of the project team (client, engineer, and contractor) to inspect and discuss the finding. Adjustments to Site operations, if necessary, should be discussed and agreed upon by the project team prior to initiation of Site work. If possible, work areas should be re-located away from utilities.
- If conditions allow, consider using vacuum excavation.
- Depending on the proximity of utilities to the work area, low impact soil removal techniques (potholing) may be necessary to either confirm the presence of utilities or to provide protection of utilities before invasive activities. In such cases, hand excavation, hand auguring, vacuum excavation, water jet removal, or other low impact removal techniques may be necessary to a depth of 3 to 5 feet (or other depth as determined by project-specific conditions). In cases where a high priority utility is located within 10 feet of the work area, documentation from the utility owner must be obtained allowing potholing before any work can be conducted. If the utility is not found after potholing is conducted, contact DigAlert and the utility owner immediately to request additional information as to the location of the utility. It is necessary to conduct potholing activities before any work can be conducted in the vicinity (within 10 feet) of the high priority utility.
- If utility location markings are lost, damaged, or faded, a new utility location survey should be conducted to replace the missing or damaged markings. Please note that some municipalities require that all utility markings be removed after work is completed. Black spray paint may be used to cover up utility markings in the street but must be removed from sidewalks.
- In all cases, State, local, utility-specific requirements, facility-specific controls, permits, and operations should be considered and incorporated into the Utility Protection Hazard Mitigator.
- Utility protection should be addressed during each tailgate or job briefing in order to reinforce below-ground utility location and the avoidance of above-ground utilities.

ALLERGIC REACTION TO POISONOUS PLANTS

- Be able to recognize and identify poisonous plants indigenous to the Site location (e.g., poison ivy, poison oak, poison sumac). For example, poison Ivy plants have three leaves arranged at the end of each stem. Two secondary leaves are attached opposite one another and directly to the stem at their base. The primary leaf is attached to the end of the stem. The leaves often, but NOT ALWAYS, have a shiny appearance. See photos below.



- Poison Ivy often appears as ground cover at the edge of wooded areas and along trails within fields and woods. It may also appear growing from a vine wrapped around trees.
- Avoid or remove poisonous plants where practicable. Wear appropriate protective clothing (e.g., gloves, long-sleeved shirts) as required.
- One can become sensitized (like a latex allergy) though immune for several years at the beginning.
- If you come in contact with the plant, the plant's oil will be transferred onto your skin and clothing. The best way to manage the oil is to wash skin with cool water and soap (preferably 5% tincture of green soap available at CVS). If soap and water is unavailable, thorough (2-3 minutes) rinsing with cold water may help (not warm...want to keep those pores closed!)
- The lag time between exposure and symptoms can be quite long like several days.
- If you are in the field, blot the area with an alcohol patch and follow by washing as soon as possible. Calamine lotion, Tecnu, yellow laundry soap, or Colloidal oatmeal (Aveeno[®]) baths provide relief from itching and rashes. More information about Tecnu can be found at <http://www.teclabsinc.com/>.
- If you have to pass through heavy ivy growth, be sure to carefully handle your field cloths when you return. Your shoe laces will always get you if you are not careful. The oil can last on clothing for a few weeks, so wash frequently.
- For additional information, please see <http://poisonivy.aesir.com/>

STINGING INSECTS / VERMIN / SNAKES

- Be able to recognize stinging insects/vermin/snakes indigenous to the Site location and habitats. Learn the indigenous dangerous species (e.g., spiders, snakes, ticks) prior to entering the field and know the first aid treatments.
- Venomous snakes swim on top of the water, non-venomous snakes swim with only their heads above water.
- Advise the SHSO if you have allergies to any insects prior to engaging in any field activities.

The task(s) for which these Hazard Mitigators apply are presented in the Appendix C Directory

- Include the following preventative measures as necessary: wear light-colored clothing, keep clothing buttoned, tuck pant legs into socks, keep shirt tails tucked in, boots, hoods, netting, gloves, masks, insect repellants or other personal protection.
- Snake bite kits are commercially available and should be carried by field personnel when working where venomous snakes exist. In the case of a snake bite, keep the patient calm, restrict activity and immobilize the bite area (do not elevate), and immediately obtain medical attention.
- Report any bites or stings to the SHSO and seek medical attention immediately.
- Be aware of potential hive/nest locations, which may include culverts, drainage pipes, junk piles, or dense shrubbery.
- Advise the SHSO if you are allergic to stinging insects prior to engaging in any field activities.
- Include the following controls:
 - Do not agitate stinging insects or disrupt their hive/nest.
 - Wear light-colored clothes.
 - Avoid wearing perfumes, hair spray, or scented lotions in the wilderness.
- If attacked:
 - Do not scream or wave arms.
 - Cover your face with your hands.
 - Run for shelter in a building or vehicle. Do not seek shelter in water.
 - Remove stingers as quickly as possible to lessen the amount of venom entering the body. Remove the stinger by raking your fingernail across it. Don't pinch or pull the stinger out. Put ice on the sting to reduce the swelling.

Report any stings to the SHSO and seek first aid or emergency medical care immediately if stung several times.

Appendix D

Constituents of Concern (COCs)

<i>Constituent</i> ¹	<i>Medium</i> ²	<i>Maximum Concentration</i> ³
Trichloroethene (TCE)	GW	7,600 µg/L
	Soils	0.120 mg/kg
Tetrachloroethene (PCE)	GW	254 µg/L
	Soils	0.042 mg/kg
cis-1,2-Dichloroethene (DCE)	GW	2,150 µg/L
	Soils	0.0034 mg/kg
Vinyl Chloride (VC)	GW	220 µg/L
	Soils	0.042 mg/kg


Footnotes:

- 1 Constituents that are included on this list have either been detected at the Site at concentrations that may cause potential dermal, ingestion, or inhalation hazards, or the constituent is suspected to potentially be present at elevated concentrations but no analytical data are available.
- 2 Type of medium (i.e. soil, water, sludge, etc.).
- 3 Maximum concentration previously detected for the constituent based on historic data (if available). Liquid concentrations are presented in micrograms of constituent per liter of solution (ug/L). Solids concentrations are presented in milligrams of constituent per kilogram of soil (mg/kg). Soil gas and/or vapor concentrations are reported in milligrams of constituent per cubic meter of gas/vapor (mg/m³).

Trichloroethylene

Synonyms & Trade Names

Ethylene trichloride, TCE, Trichloroethene, Trilene

CAS No.	RTECS No.	DOT ID & Guide
79-01-6	<u>KX4550000</u>	1710 <u>160</u> 
Formula	Conversion	IDLH
ClCH=CCl ₂	1 ppm = 5.37 mg/m ³	Ca [1000 ppm] See: <u>79016</u>

Exposure Limits

NIOSH REL

: Ca See Appendix A See Appendix C

OSHA PEL

‡: TWA 100 ppm C 200 ppm 300 ppm (5-minute maximum peak in any 2 hours)

Measurement Methods

NIOSH 1022 ,
3800 

OSHA 1001

See: NMAM or OSHA Methods

Physical Description

Colorless liquid (unless dyed blue) with a chloroform-like odor.

MW:	BP:	FRZ:	Sol:	VP:	IP:
131.4	189°F	-99°F	0.1%	58 mmHg	9.45 eV
Sp.Gr:	Fl.P:	UEL(77°F): 10.5%	LEL(77°F): 8%		
1.46	?				

Combustible Liquid, but burns with difficulty.

Incompatibilities & Reactivities

Strong caustics & alkalis; chemically-active metals (such as barium, lithium, sodium, magnesium, titanium & beryllium)

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact	
Symptoms irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]	
Target Organs Eyes, skin, respiratory system, heart, liver, kidneys, central nervous system	
Cancer Site [in animals: liver & kidney cancer]	
Personal Protection/Sanitation (See protection codes) Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation Provide: Eyewash, Quick drench	First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately
Respirator Recommendations NIOSH At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration: (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode (APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus Escape: (APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister Any appropriate escape-type, self-contained breathing apparatus	

Important additional information about respirator selection

See also: [INTRODUCTION](#) See ICSC CARD: [0081](#) See MEDICAL TESTS: [0236](#)

Tetrachloroethylene

Synonyms & Trade Names

Perchloroethylene, Perchloroethylene, Perk, Tetrachlorethylene

CAS No.

127-18-4

RTECS No.

[KX3850000](#)

DOT ID & Guide

1897 [160](#)

Formula

$\text{Cl}_2\text{C}=\text{CCl}_2$

Conversion

1 ppm = 6.78 mg/m³

IDLH

Ca [150 ppm]
See: [127184](#)

Exposure Limits




NIOSH REL

: Ca Minimize workplace exposure concentrations. See [Appendix A](#)

OSHA PEL

‡: TWA 100 ppm
C 200 ppm (for 5 minutes in any 3-hour period), with a maximum peak of 300 ppm

Measurement Methods

NIOSH 1003 ;
OSHA 1001 ;
See: [NMAM](#) or [OSHA Methods](#) 

Physical Description

Colorless liquid with a mild, chloroform-like odor.

MW:

165.8

BP:

250°F

FRZ:

-2°F

Sol:

0.02%

VP:

14 mmHg

IP:

9.32 eV

Sp.Gr:

1.62

Fl.P:

NA

UEL:

NA

LEL:

NA

Noncombustible Liquid, but decomposes in a fire to hydrogen chloride and phosgene.

Incompatibilities & Reactivities

Strong oxidizers; chemically-active metals such as lithium, beryllium & barium; caustic soda; sodium hydroxide; potash

Exposure Routes

inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms

irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen]

Target Organs

Eyes, skin, respiratory system, liver, kidneys, central nervous system

Cancer Site

[in animals: liver tumors]

Personal Protection/Sanitation

(See protection codes)

Skin: Prevent skin contact

Eyes: Prevent eye contact

Wash skin: When contaminated

Remove: When wet or contaminated

Change: No recommendation

Provide: Eyewash, Quick drench

First Aid

(See procedures)

Eye: Irrigate immediately

Skin: Soap wash promptly

Breathing: Respiratory support

Swallow: Medical attention immediately

Respirator Recommendations

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection

See also: INTRODUCTION See ICSC CARD: 0076 See MEDICAL TESTS: 0179

1,2-Dichloroethylene

Synonyms & Trade Names

Acetylene dichloride, cis-Acetylene dichloride, trans-Acetylene dichloride, sym-Dichloroethylene


CAS No.

540-59-0

RTECS No.

KV9360000

DOT ID & Guide

1150 130P

Formula

ClCH=CHCl

Conversion

1 ppm = 3.97 mg/m³

IDLH

1000 ppm
See: 540590

Exposure Limits




NIOSH REL

: TWA 200 ppm (790 mg/m³)

OSHA PEL

: TWA 200 ppm (790 mg/m³)

Measurement Methods

NIOSH 1003 ;
OSHA 7 
See: NMAM or OSHA Methods

Physical Description

Colorless liquid (usually a mixture of the cis & trans isomers) with a slightly acrid, chloroform-like odor.

MW:

97.0

BP:

118-140°F

FRZ:

-57 to -115°F

Sol:

0.4%

VP:

180-265 mmHg

IP:

9.65 eV

Sp.Gr(77°F): 1.27

FLP:

36-39°F

UEL:

12.8%

LEL:

5.6%

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

Incompatibilities & Reactivities

Strong oxidizers, strong alkalis, potassium hydroxide, copper [Note: Usually contains inhibitors to prevent polymerization.]

Exposure Routes

inhalation, ingestion, skin and/or eye contact

Symptoms

irritation eyes, respiratory system; central nervous system depression

Target Organs

Eyes, respiratory system, central nervous system

Personal Protection/Sanitation

(See protection codes)

Skin: Prevent skin contact

Eyes: Prevent eye contact

Wash skin: When contaminated

Remove: When wet (flammable)

Change: No recommendation

First Aid

(See procedures)

Eye: Irrigate immediately

Skin: Soap wash promptly

Breathing: Respiratory support

Swallow: Medical attention immediately

Respirator Recommendations

NIOSH/OSHA

Up to 1000 ppm:

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode^ε

(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)^ε

(APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s)

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister

(APF = 50) Any self-contained breathing apparatus with a full facepiece

(APF = 50) Any supplied-air respirator with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister

Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection

See also: INTRODUCTION See ICSC CARD: 0436

Vinyl chloride

Synonyms & Trade Names

Chloroethene, Chloroethylene, Ethylene monochloride, Monochloroethene, Monochloroethylene, VC, Vinyl chloride monomer (VCM)

CAS No.

75-01-4

RTECS No.

KU9625000

DOT ID & Guide

1086 116P (inhibited)

Formula

CH₂=CHCl

Conversion

1 ppm = 2.56 mg/m³

IDLH

Ca [N.D.]
See: IDLH INDEX

Exposure Limits





NIOSH REL

: Ca See Appendix A

OSHA PEL

: [1910.1017] TWA 1 ppm C 5 ppm [15-minute]

Measurement Methods

NIOSH 1007 
OSHA 4 , **75** 
See: NMAM or OSHA Methods 

Physical Description

Colorless gas or liquid (below 7°F) with a pleasant odor at high concentrations. [Note: Shipped as a liquefied compressed gas.]

consultants					
MW:	BP:	FRZ:	Sol(77°F): 0.1%	VP:	IP:
62.5	7°F	-256°F		3.3 atm	9.99 eV
	FLP:	UEL:	LEL:	RGasD:	
	NA (Gas)	33.0%	3.6%	2.21	
Flammable Gas					
Incompatibilities & Reactivities					
Copper, oxidizers, aluminum, peroxides, iron, steel [Note: Polymerizes in air, sunlight, or heat unless stabilized by inhibitors such as phenol. Attacks iron & steel in presence of moisture.]					
Exposure Routes					
inhalation, skin and/or eye contact (liquid)					
Symptoms					
lassitude (weakness, exhaustion); abdominal pain, gastrointestinal bleeding; enlarged liver; pallor or cyanosis of extremities; liquid: frostbite; [potential occupational carcinogen]					
Target Organs					
Liver, central nervous system, blood, respiratory system, lymphatic system					
Cancer Site					
[liver cancer]					
Personal Protection/Sanitation				First Aid	
(See protection codes) Skin: Frostbite Eyes: Frostbite Wash skin: No recommendation Remove: When wet (flammable) Change: No recommendation Provide: Frostbite wash				(See procedures) Eye: Frostbite Skin: Frostbite Breathing: Respiratory support	
Respirator Recommendations					
(See Appendix E)					

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection

See also: INTRODUCTION See ICSC CARD: 0082 See MEDICAL TESTS: 0241

Appendix E

Air Monitoring Equipment, Frequency of Readings, and Action Guidelines per Task

Applies to Task: ☐ ① ☐ ② ☐ ③ ☒ ④ ☒ ⑤ ☐ ⑥ ☒ ⑦ ☐ ⑧

<input type="checkbox"/> Explosimeter Brand/Model No.: _____ Monitoring Frequency: _____	<input type="checkbox"/> Oxygen Meter Brand/Model No.: _____ Monitoring Frequency: _____	<input checked="" type="checkbox"/> Photoionization Detector Brand/Model No.: RAE Systems MiniRAE 3000 Monitoring Frequency: Continuous																									
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Source (% LEL)</th> <th style="width: 15%;">Reading</th> <th style="width: 70%;">Action</th> </tr> </thead> <tbody> <tr> <td>1 to 10</td> <td></td> <td>Continue with caution.</td> </tr> <tr> <td>Greater than 10</td> <td></td> <td>Stop work. Evacuate the area. If upon return, if concentration still exceeds 10% LEL, ventilate until concentration is back to <10% LEL.</td> </tr> </tbody> </table> Note: _____	Source (% LEL)	Reading	Action	1 to 10		Continue with caution.	Greater than 10		Stop work. Evacuate the area. If upon return, if concentration still exceeds 10% LEL, ventilate until concentration is back to <10% LEL.	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Reading (%)</th> <th style="width: 85%;">Action</th> </tr> </thead> <tbody> <tr> <td>Less than 19.5</td> <td>No action. Stop work. Evacuate the area.</td> </tr> <tr> <td>19.5 to 23.5</td> <td>Continue to work with caution. Stop work. Evacuate the area.</td> </tr> <tr> <td>Greater than 23.5</td> <td></td> </tr> </tbody> </table> Note: _____	Reading (%)	Action	Less than 19.5	No action. Stop work. Evacuate the area.	19.5 to 23.5	Continue to work with caution. Stop work. Evacuate the area.	Greater than 23.5		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Breathing Zone Reading (ppm)</th> <th style="width: 85%;">Action</th> </tr> </thead> <tbody> <tr> <td>0 to 10</td> <td>Level D PPE</td> </tr> <tr> <td>>10 to 100</td> <td>Level C PPE</td> </tr> <tr> <td>Greater than 100</td> <td>Stop work. Evacuate the area. If upon return, levels still exceed 100, Stop work and implement engineering controls.</td> </tr> </tbody> </table> Note: _____	Breathing Zone Reading (ppm)	Action	0 to 10	Level D PPE	>10 to 100	Level C PPE	Greater than 100	Stop work. Evacuate the area. If upon return, levels still exceed 100, Stop work and implement engineering controls.
Source (% LEL)	Reading	Action																									
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Greater than 10		Stop work. Evacuate the area. If upon return, if concentration still exceeds 10% LEL, ventilate until concentration is back to <10% LEL.																									
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>10 to 100	Level C PPE																										
Greater than 100	Stop work. Evacuate the area. If upon return, levels still exceed 100, Stop work and implement engineering controls.																										
<input type="checkbox"/> Flame Ionization Detector Brand/Model No.: _____ Monitoring Frequency: _____	<input type="checkbox"/> Chemical Detector Tube Brand/Model No.: _____ Monitoring Frequency: _____	<input type="checkbox"/> Other Brand/Model No.: _____ Monitoring Frequency: _____																									
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Breathing Zone Reading (ppm)</th> <th style="width: 85%;">Action</th> </tr> </thead> <tbody> <tr> <td>_____ to _____</td> <td>Level D PPE</td> </tr> <tr> <td>_____ to _____</td> <td>Level C PPE</td> </tr> <tr> <td>Greater than _____</td> <td>Stop work. Evacuate the area. If upon return, levels still exceed ____, stop work and implement engineering controls.</td> </tr> </tbody> </table> Note: _____	Breathing Zone Reading (ppm)	Action	_____ to _____	Level D PPE	_____ to _____	Level C PPE	Greater than _____	Stop work. Evacuate the area. If upon return, levels still exceed ____, stop work and implement engineering controls.	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Breathing Zone Reading (ppm)</th> <th style="width: 85%;">Action</th> </tr> </thead> <tbody> <tr> <td>_____ to _____</td> <td>Level D PPE</td> </tr> <tr> <td>_____ to _____</td> <td>Level C PPE</td> </tr> <tr> <td>Greater than _____</td> <td>Stop work. Evacuate the area. If upon return, levels still exceed ____, stop work and implement engineering controls.</td> </tr> </tbody> </table> Note: _____	Breathing Zone Reading (ppm)	Action	_____ to _____	Level D PPE	_____ to _____	Level C PPE	Greater than _____	Stop work. Evacuate the area. If upon return, levels still exceed ____, stop work and implement engineering controls.	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Breathing Zone Reading</th> <th style="width: 85%;">Action</th> </tr> </thead> <tbody> <tr> <td>_____ to _____</td> <td>Level D PPE</td> </tr> <tr> <td>_____ to _____</td> <td>Level C PPE</td> </tr> <tr> <td>Greater than _____</td> <td>Stop work. Evacuate the area. If upon return, levels still exceed ____, stop work and implement engineering controls.</td> </tr> </tbody> </table> Note: _____	Breathing Zone Reading	Action	_____ to _____	Level D PPE	_____ to _____	Level C PPE	Greater than _____	Stop work. Evacuate the area. If upon return, levels still exceed ____, stop work and implement engineering controls.	
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_____ to _____	Level C PPE																										
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Appendix F

Personal Protective Equipment per Task

	Task ①	Task ②	Task ③	Task ④	Task ⑤	Task ⑥	Task ⑦	Task ⑧
Potential PPE Level per Task:	<input checked="" type="checkbox"/> D <input type="checkbox"/> C	<input checked="" type="checkbox"/> D <input type="checkbox"/> C	<input checked="" type="checkbox"/> D <input type="checkbox"/> C	<input checked="" type="checkbox"/> D <input type="checkbox"/> C	<input checked="" type="checkbox"/> D <input type="checkbox"/> C	<input checked="" type="checkbox"/> D <input type="checkbox"/> C	<input checked="" type="checkbox"/> D <input type="checkbox"/> C	<input type="checkbox"/> D <input type="checkbox"/> C
Modified Level D*				Level C*				
Equipment		Material/Type		Equipment		Material/Type		
<input type="checkbox"/> Protective clothing				<input type="checkbox"/> Full-face air-purifying respirator		Cartridge Type:		
<input type="checkbox"/> Outer gloves				<input type="checkbox"/> Half-mask air-purifying respirator		Cartridge Type:		
<input type="checkbox"/> Outer boots				<input type="checkbox"/> Protective clothing				
<input checked="" type="checkbox"/> Hard hat**				<input type="checkbox"/> Outer gloves				
<input checked="" type="checkbox"/> Safety glasses**				<input type="checkbox"/> Inner gloves				
<input checked="" type="checkbox"/> Hard-toed boots**				<input type="checkbox"/> Outer boots				
<input checked="" type="checkbox"/> Hearing protection**				<input type="checkbox"/> Hard hat**				
<input type="checkbox"/> Other:				<input type="checkbox"/> Safety glasses**				
				<input type="checkbox"/> Hard-toed boots**				
				<input type="checkbox"/> Hearing protection**				
				<input type="checkbox"/> Other:				

* If checked, indicates initial level of PPE. Other completed columns indicate information to upgrade/downgrade.

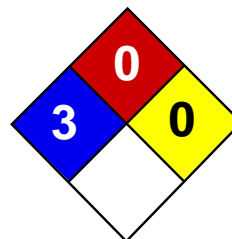
** Optional as applicable

Appendix G

Material Safety Data Sheets

<i>Included in HASP</i>	<i>Chemical</i>
<input type="checkbox"/>	Acetone
<input checked="" type="checkbox"/>	Alconox
<input type="checkbox"/>	Ammonia
<input checked="" type="checkbox"/>	Bentonite
<input type="checkbox"/>	Diesel Fuel Oil No. 2-D
<input type="checkbox"/>	Gasoline
<input type="checkbox"/>	Helium
<input type="checkbox"/>	<i>n</i> -Hexane
<input checked="" type="checkbox"/>	Hydrochloric Acid
<input type="checkbox"/>	Hydrogen
<input checked="" type="checkbox"/>	Isobutylene Calibration Gas
<input type="checkbox"/>	Isopropyl Alcohol
<input type="checkbox"/>	KB-1
<input type="checkbox"/>	Methane Calibration Gas
<input checked="" type="checkbox"/>	Nitric Acid
<input type="checkbox"/>	Permanganate
<input checked="" type="checkbox"/>	Portland Cement
<input type="checkbox"/>	Sulfuric Acid
<input checked="" type="checkbox"/>	Other: <u>Methanol</u>

MSDSs



Health	3
Fire	0
Reactivity	0
Personal Protection	

Material Safety Data Sheet

Nitric Acid, 10% w/w MSDS

Section 1: Chemical Product and Company Identification

Product Name: Nitric Acid, 10% w/w

Catalog Codes: SLN1330

CAS#: Mixture.

RTECS: Not applicable.

TSCA: TSCA 8(b) inventory: Nitric acid, 70%; Water

CI#: Not applicable.

Synonym:

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Water	7732-18-5	93
Nitric acid, fuming	7697-37-2	7

Toxicological Data on Ingredients: Nitric acid, fuming: VAPOR (LC50): Acute: 67 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:

Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant), of ingestion, of inhalation. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:

Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant), of ingestion, of inhalation. Non-sensitizer for skin. CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist

may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs. Repeated or prolonged inhalation of vapors may lead to chronic respiratory irritation.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact:

If the chemical got onto the clothed portion of the body, remove the contaminated clothes as quickly as possible, protecting your own hands and body. Place the victim under a deluge shower. If the chemical got on the victim's exposed skin, such as the hands : Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cold water may be used. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. **WARNING:** It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:

Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Slightly explosive to explosive in presence of reducing materials, of combustible materials, of organic materials.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:

Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:

Corrosive liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep locked up Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapour/spray. Never add water to this product In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes Keep away from incompatibles such as reducing agents, combustible materials, metals, alkalis. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage:

May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package. Corrosive materials should be stored in a separate safety storage cabinet or room.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

Nitric acid, fuming TWA: 2 CEIL: 4 (ppm) TWA: 5 CEIL: 10 (mg/m3) Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Disagreeable and choking. (Strong.)

Taste: Not available.

Molecular Weight: Not applicable.

Color: Clear Colorless.

pH (1% soln/water): Acidic.

Boiling Point: The lowest known value is 82.6°C (180.7°F) (Nitric acid, fuming). Weighted average: 98.78°C (209.8°F)

Melting Point: May start to solidify at -41.6°C (-42.9°F) based on data for: Nitric acid, fuming.

Critical Temperature: Not available.

Specific Gravity: Weighted average: 1.02 (Water = 1)

Vapor Pressure:

The highest known value is 45 mm of Hg (@ 20°C) (Nitric acid, fuming). Weighted average: 19.46 mm of Hg (@ 20°C)

Vapor Density: The highest known value is 0.62 (Air = 1) (Water).

Volatility: Not available.

Odor Threshold: The highest known value is 0.29 ppm (Nitric acid, fuming)

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility: Easily soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances:

Extremely reactive or incompatible with alkalis. Highly reactive with metals. Reactive with reducing agents, combustible materials. Slightly reactive to reactive with organic materials, acids.

Corrosivity:

Highly corrosive in presence of steel, of aluminum, of zinc, of copper. Corrosive in presence of stainless steel(304). Slightly corrosive to corrosive in presence of stainless steel(316). Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute toxicity of the vapor (LC50): 957 ppm 4 hour(s) (Rat) (Calculated value for the mixture).

Chronic Effects on Humans: The substance is toxic to lungs, mucous membranes.

Other Toxic Effects on Humans: Very hazardous in case of skin contact (corrosive, irritant, permeator), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 8: Corrosive liquid.

Identification: : Nitric acid, solution (Nitric acid, fuming) : NA2031 PG: II

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:

Pennsylvania RTK: Nitric acid, 70% Massachusetts RTK: Nitric acid, 70% TSCA 8(b) inventory: Nitric acid, 70%; Water SARA 302/304/311/312 extremely hazardous substances: Nitric acid, 70% SARA 313 toxic chemical notification and release reporting: Nitric acid, 70% CERCLA: Hazardous substances.: Nitric acid, 70%;

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):

CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):

R26- Very toxic by inhalation. R35- Causes severe burns.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 0

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 11:00 AM

Last Updated: 06/09/2012 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.



MATERIAL SAFETY DATA SHEET

BENTONITE PELLETS

1. PRODUCT IDENTIFICATION

TRADE NAME: BENTONITE PELLETS
Use: Natural Mineral Montmorillonite drilling fluid additive
Description: Natural Sodium Bentonite

Supplier Name: Fluidstar (Pty) Ltd
Address: Unit 3/No. 1 General McArthur Place Redbank Qld 4301
Telephone: + 61(0) 7 3288 4480, email: info@fluidstar.com.au
Emergency Contact: +61 400 195 406

2. HAZARDS IDENTIFICATION

NON-HAZARDOUS ACCORDING TO CRITERIA OF AUSTRALIAN NATIONAL OCCUPATIONAL HEALTH & SAFETY COMMISSION (NOHSC), AUSTRALIA.
NOT CLASSIFIED AS DANGEROUS GOODS, ACCORDING TO THE AUSTRALIAN CODE FOR THE TRANSPORT OF DANGEROUS GOODS BY ROAD AND RAIL.

RISK PHRASES:

Not applicable

SAFETY PHRASES:

S22 Do not breathe dust.

S38 If insufficient ventilation, wear suitable respiratory equipment.

CAUTION:

Avoid inhalation. Avoid contact with eyes. Do not take internally.

3. COMPOSITION / INFORMATION ON INGREDIENTS

Ingredient	CAS #	Concentration
Smectite	12199-37-0	>74%
Quartz/Cristobalite	14808-60-7& 14464-46-1	<18%
Plagioclase	Mixture	<8%
Feldspar/Kaolinite		

4. FIRST AID INFORMATION

FIRST AID

EYES:

Flush the eyes immediately with large amounts of water, lifting the upper and lower lids occasionally. If irritation persists or for imbedded foreign body, get immediate medical attention.

SKIN:

No first aid should be needed since this product does not affect the skin. Wash exposed skin with soap and water before breaks and at the end of the shift.

INGESTION:

Do not induce vomiting. Wash mouth with water. If symptoms persist, get immediate medical attention.

INHALATION:

Remove source of contamination or move victim to fresh air. If breathing has stopped, perform artificial respiration. If breathing is difficult have qualified personnel administer oxygen. Get prompt medical attention.

NOTE TO PHYSICIAN:

Based on the individual reactions of the patient, the physician's judgment should be used to control symptoms and clinical condition.

CAUTION:

If unconscious, having trouble breathing or in convulsions, do not induce vomiting or give water.

5. FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA:

This product is not considered flammable, nor will it support combustion. However the packaging may burn under fire conditions. Use extinguishing media appropriate to the surrounding fire. Do not use water jets.

COMBUSTION PRODUCTS:

Smoke, fumes and dust may be generated in a large fire.

FLAMMABLE LIMITS:

Not Applicable LEL - Not Applicable UEL - Not Applicable

UNUSUAL FIRE AND EXPLOSION HAZARD:

None known

6. ACCIDENTAL RELEASE MEASURES

SPILL CONTROL AND RECOVERY:

Vacuum if possible to avoid generating airborne dust. Avoid breathing dust. Wear an approved respirator. Avoid adding water; product will become slippery when wet.

Waste Disposal Method – Follow federal, state and local regulations for solid waste.

DISPOSAL:

If this product becomes a waste, it does not meet the criteria of a hazardous waste.

7. HANDLING AND STORAGE

HANDLING:

Prevent the creation of dust concentration higher than the occupational exposure limit. Wear appropriate protective equipment to prevent inhalation, skin and eye contact. Keep containers closed when not in use. Ensure a high level of personal hygiene is maintained when using the product.

STORAGE:

Store in a dry area. Keep container tightly sealed.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

NATIONAL EXPOSURE STANDARDS:

No exposure standards have been established for this material by the Australian National Occupational Health & Safety Commission (NOHSC). However, the available exposure limits on ingredients are as follows:

Quartz- TWA 0.1 mg/m³

Cristobolite-TWA 0.1 mg/m³

In addition, NOHSC has set the following exposure standard for dust not otherwise specified:

Dust-TWA 10 mg/m³ (inspirable fraction).

TWA (Time Weighted Average): The average airborne concentration of a particular substance when calculated over a normal eight-hour working day, for a five-day week.

RESPIRATORY PROTECTION:

If engineering controls are not effective in controlling airborne exposure then an approved respirator with a replaceable particulate filter should be used. Reference should be made to Australian Standards AS/NZS 1715, Selection, Use and Maintenance of Respiratory Protective Devices; and AS/NZS 1716, Respiratory Protective Devices, in order to make any necessary changes for individual circumstances.

Eye Protection

Safety glasses with side shields or chemical goggles should be worn. Final choice of appropriate eye/face protection will vary according to individual circumstances. Eye protection devices should conform with Australian/New Zealand Standard AS/NZS 1337 - Eye Protectors for Industrial Applications.

Hand Protection

Wear gloves of impervious material conforming to AS/NZS 2161: Occupational protective gloves - Selection, use and maintenance. Final choice of appropriate glove type will vary according to individual circumstances. This can include methods of handling, and engineering controls as determined by appropriate risk assessments.

Body Protection

Suitable protective workwear should be worn when working with this material, e.g. cotton overalls buttoned at neck and wrist.

Engineering Controls

Good ventilation adequate to maintain the concentration below exposure standards is required.



HYGIENE MEASURES:

Ensure a high level of personal hygiene is maintained when using this product. Always wash hands before eating, drinking, smoking or using the toilet facilities.

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE AND ODOR:	Tan or beige to light gray colored tablets, odourless
BOILING POINT:	Not Applicable
SPECIFIC GRAVITY:	(Water = 1.0) - 2.38
pH VALUE:	7-10 (20% aqueous slurry)
FLASH POINT:	Non-combustible solid
SOLUBILITY IN WATER:	Insoluble. Forms colloidal suspensions in water, with strong thixotropic properties.

10. STABILITY AND REACTIVITY

STABILITY:

Stable

CONDITIONS TO AVOID:

None Known

INCOMPATIBILITY:

(Materials to Avoid): None Known

Hazardous Decomposition or By-products:

None Known

HAZARDOUS POLYMERIATION:

Will Not Occur

11. TOXICOLOGY INFORMATION

Ecotoxicity

Not available

12. ECOLOGICAL INFORMATION

MOBILITY:

Not available

PERSISTENCE /DEGRADABILITY:

Not available

BIOACCUMULATION:

Not available

ECOTOXICITY:

Not available

13. DISPOSAL REGULATIONS

SPILL CONTROL AND RECOVERY:

Vacuum if possible to avoid generating airborne dust. Avoid breathing dust. Wear an approved respirator. Avoid adding water; product will become slippery when wet. Waste Disposal Method – Follow federal, state and local regulations for solid waste.

DISPOSAL:

If this product becomes a waste, it does not meet the criteria of a hazardous waste.

14. TRANSPORT INFORMATION

THE PRODUCT IS NOT CLASSIFIED AS DANGEROUS GOODS, ACCORDING TO THE AUSTRALIAN CODE FOR THE TRANSPORT OF DANGEROUS GOODS BY ROAD AND RAIL.

UN NUMBER: None allocated

SHIPPING NAME: None allocated

DANGEROUS GOODS CLASS: None allocated

HAZCHEM CODE: None allocated

SUBSIDIARY RISK: None allocated

PACKAGING GROUP: None allocated

EPG NUMBER: None allocated

15. REGULATORY INFORMATION**POISONS SCHEDULE:**

None allocated

AICS:

All chemicals listed on the Australian Inventory of Chemical Substances.

HAZARD CATEGORY:

Toxic

16. OTHER INFORMATION**Date of Preparation:** Issue Date 20-Oct-05**Last Revision:** Revised 14 Apr 2009**CONTACT POINTS**

ORGANISATION	TELEPHONE
Poisons Information Centre –Australia Wide	131126
Fluidstar	+61 7 3288 8485
	0400 195 406
Fire Brigade	000
Police	000

Disclaimer:

Every endeavor has been made to ensure that the information contained in this publication is reliable and offered in good faith. It is meant to describe the safety requirements of our products and should not be construed as guaranteeing specific properties. Customers are encouraged to conduct their own tests as end user suitability of the product for particular uses is beyond our control. The information is not intended as an inducement to bargain and no warranty expressed or implied is made as to its accuracy, reliability or completeness. FLUIDSTAR Pty Ltd accepts no liability for loss, injury or damage arising from reliance upon the information contained in this data sheet except in conjunction with the proper use of the product to which it refers. Due care should be taken that the use and disposal of this product is in compliance with appropriate Federal, State and Local Government regulations.

END OF MSDS

MATERIAL SAFETY DATA SHEET

ALCONOX®

Prepared to U.S. OSHA, CMA, ANSI, Canadian WHMIS, Australian WorkSafe, Japanese Industrial Standard JIS Z 7250:2000, and European Union REACH Regulations



SECTION 1 - PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: **ALCONOX®**
CHEMICAL FAMILY NAME: Detergent.
PRODUCT USE: Critical-cleaning detergent for laboratory, healthcare and industrial applications
U.N. NUMBER: Not Applicable
U.N. DANGEROUS GOODS CLASS: Non-Regulated Material
SUPPLIER/MANUFACTURER'S NAME: Alconox, Inc.
ADDRESS: 30 Glenn St., Suite 309, White Plains, NY 10603. USA
EMERGENCY PHONE: **TOLL-FREE in USA/Canada** 800-255-3924
International calls 813-248-0585
BUSINESS PHONE: 914-948-4040
DATE OF PREPARATION: May 2011
DATE OF LAST REVISION: February 2008

SECTION 2 - HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: This product is a white granular powder with little or no odor. Exposure can be irritating to eyes, respiratory system and skin. It is a non-flammable solid. The Environmental effects of this product have not been investigated.

US DOT SYMBOLS

Non-Regulated

CANADA (WHMIS) SYMBOLS



EUROPEAN and (GHS) Hazard Symbols



Signal Word: **Warning!**

EU LABELING AND CLASSIFICATION:

Classification of the substance or mixture according to Regulation (EC) No1272/2008 Annex 1

EC# 205-633-8 This substance is not classified in the Annex I of Directive 67/548/EEC

EC# 268-356-1 This substance is not classified in the Annex I of Directive 67/548/EEC

EC# 231-838-7 This substance is not classified in the Annex I of Directive 67/548/EEC

EC# 231-767-1 This substance is not classified in the Annex I of Directive 67/548/EEC

EC# 207-638-8 Index# 011-005-00-2

EC# 205-788-1 This substance is not classified in the Annex I of Directive 67/548/EEC

GHS Hazard Classification(s):

Eye Irritant Category 2A

Hazard Statement(s):

H319: Causes serious eye irritation

Precautionary Statement(s):

P260: Do not breath dust/fume/gas/mist/vapors/spray

P264: Wash hands thoroughly after handling

P271: Use only in well ventilated area.

P280: Wear protective gloves/protective clothing/eye protection/face protection/

Hazard Symbol(s):

[Xi] Irritant

MATERIAL SAFETY DATA SHEET

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Risk Phrases:

R20: Harmful by inhalation
R36/37/38: Irritating to eyes, respiratory system and skin

Safety Phrases:

S8: Keep container dry
S22: Do not breath dust
S24/25: Avoid contact with skin and eyes

HEALTH HAZARDS OR RISKS FROM EXPOSURE:

ACUTE: Exposure to this product may cause irritation of the eyes, respiratory system and skin. Ingestion may cause gastrointestinal irritation including pain, vomiting or diarrhea.

CHRONIC: This product contains an ingredient which may be corrosive.

TARGET ORGANS:

ACUTE: Eye, respiratory System, Skin

CHRONIC: None Known

SECTION 3 - COMPOSITION and INFORMATION ON INGREDIENTS

HAZARDOUS INGREDIENTS:	CAS #	EINECS #	ICSC #	WT %	HAZARD CLASSIFICATION; RISK PHRASES
Sodium Bicarbonate	144-55-8	205-633-8	1044	33 - 43%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium (C10 – C16) Alkylbenzene Sulfonate	68081-81-2	268-356-1	Not Listed	10 – 20%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium Tripolyphosphate	7758-29-4	231-838-7	1469	5 - 15%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Tetrasodium Pyrophosphate	7722-88-5	231-767-1	1140	5 - 15%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium Carbonate	497-19-8	207-638-8	1135	1 - 10%	HAZARD CLASSIFICATION: [Xi] Irritant RISK PHRASES: R36
Sodium Alcohol Sulfate	151-21-3	205-788-1	0502	1 – 5%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Balance of other ingredients are non-hazardous or less than 1% in concentration (or 0.1% for carcinogens, reproductive toxins, or respiratory sensitizers).					

NOTE: ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-2004 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR, EU Directives and the Japanese Industrial Standard JIS Z 7250: 2000.

SECTION 4 - FIRST-AID MEASURES

Contaminated individuals of chemical exposure must be taken for medical attention if any adverse effect occurs. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to health professional with contaminated individual.

EYE CONTACT: If product enters the eyes, open eyes while under gentle running water for at least 15 minutes. Seek medical attention if irritation persists.

SKIN CONTACT: Wash skin thoroughly after handling. Seek medical attention if irritation develops and persists. Remove contaminated clothing. Launder before re-use.

INHALATION: If breathing becomes difficult, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Seek medical attention if breathing difficulty continues.

INGESTION: If product is swallowed, call physician or poison control center for most current information. If professional advice is not available, do not induce vomiting. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or who cannot swallow. Seek medical advice. Take a copy of the label and/or MSDS with the victim to the health professional.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing skin, or eye problems may be aggravated by prolonged contact.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and reduce over-exposure.

MATERIAL SAFETY DATA SHEET

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SECTION 5 - FIRE-FIGHTING MEASURES

FLASH POINT:

Not Flammable

AUTOIGNITION TEMPERATURE:

Not Applicable

FLAMMABLE LIMITS (in air by volume, %):

Lower (LEL): NA Upper (UEL): NA

FIRE EXTINGUISHING MATERIALS:

As appropriate for surrounding fire. Carbon dioxide, foam, dry chemical, halon, or water spray.

UNUSUAL FIRE AND EXPLOSION HAZARDS:

This product is non-flammable and has no known explosion hazards.

Explosion Sensitivity to Mechanical Impact:

Not Sensitive.

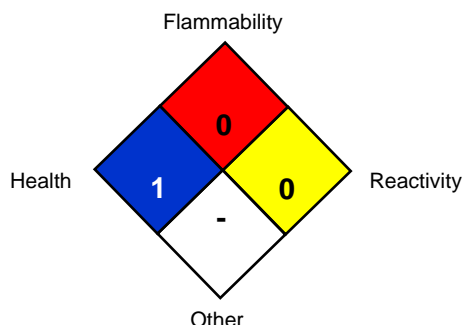
Explosion Sensitivity to Static Discharge:

Not Sensitive



SPECIAL FIRE-FIGHTING PROCEDURES:

Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Isolate materials not yet involved in the fire and protect personnel. Move containers from fire area if this can be done without risk; otherwise, cool with carefully applied water spray. If possible, prevent runoff water from entering storm drains, bodies of water, or other environmentally sensitive areas.

NFPA RATING SYSTEM



HMIS RATING SYSTEM

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM			
HEALTH HAZARD (BLUE)			1
FLAMMABILITY HAZARD (RED)			0
PHYSICAL HAZARD (YELLOW)			0
PROTECTIVE EQUIPMENT			
EYES	RESPIRATORY	HANDS	BODY
	See Sect 8		See Sect 8
For Routine Industrial Use and Handling Applications			

Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe * = Chronic hazard

SECTION 6 - ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Personnel should be trained for spill response operations.

SPILLS: Contain spill if safe to do so. Prevent entry into drains, sewers, and other waterways. Sweep, shovel or vacuum spilled material and place in an appropriate container for re-use or disposal. Avoid dust generation if possible. Dispose of in accordance with applicable Federal, State, and local procedures (see Section 13, Disposal Considerations).

SECTION 7 - HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Do not eat, drink, smoke, or apply cosmetics while handling this product. Avoid breathing dusts generated by this product. Use in a well-ventilated location. Remove contaminated clothing immediately.

STORAGE AND HANDLING PRACTICES: Containers of this product must be properly labeled. Store containers in a cool, dry location. Keep container tightly closed when not in use. Store away from strong acids or oxidizers.

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SECTION 8 - EXPOSURE CONTROLS - PERSONAL PROTECTION

EXPOSURE LIMITS/GUIDELINES:

Chemical Name	CAS#	ACGIH TWA	OSHA TWA	SWA
Sodium Bicarbonate	144-55-8	10 mg/m ³ Total Dust	15 mg/m ³ Total Dust	10 mg/m ³ Total Dust
Sodium (C10 – C16) Alkylbenzene Sulfonate	68081-81-2	10 mg/m ³ Total Dust	15 mg/m ³ Total Dust	10 mg/m ³ Total Dust
Sodium Tripolyphosphate	7758-29-4	10 mg/m ³ Total Dust	15 mg/m ³ Total Dust	10 mg/m ³ Total Dust
Tetrasodium Pyrophosphate	7722-88-5	5 mg/m ³	5 mg/m ³	5 mg/m ³
Sodium Carbonate	497-19-8	10 mg/m ³ Total Dust	15 mg/m ³ Total Dust	10 mg/m ³ Total Dust
Sodium Alcohol Sulfate	151-21-3	10 mg/m ³ Total Dust	15 mg/m ³ Total Dust	10 mg/m ³ Total Dust

Currently, International exposure limits are not established for the components of this product. Please check with competent authority in each country for the most recent limits in place.

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to ensure exposure levels are maintained below the limits provided below. Use local exhaust ventilation to control airborne dust. Ensure eyewash/safety shower stations are available near areas where this product is used.

The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132) or equivalent standard of Canada, or standards of EU member states (including EN 149 for respiratory PPE, and EN 166 for face/eye protection), and those of Japan. Please reference applicable regulations and standards for relevant details.

RESPIRATORY PROTECTION: Based on test data, exposure limits should not be exceeded under normal use conditions when using Alconox Detergent. Maintain airborne contaminant concentrations below guidelines listed above, if applicable. If necessary, use only respiratory protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), equivalent U.S. State standards, Canadian CSA Standard Z94.4-93, the European Standard EN149, or EU member states.

EYE PROTECTION: Safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133 or appropriate Canadian Standards.

HAND PROTECTION: Use chemical resistant gloves to prevent skin contact.. If necessary, refer to U.S. OSHA 29 CFR 1910.138 or appropriate Standards of Canada.

BODY PROTECTION: Use body protection appropriate to prevent contact (e.g. lab coat, overalls). If necessary, refer to appropriate Standards of Canada, or appropriate Standards of the EU, Australian Standards, or relevant Japanese Standards.

SECTION 9 - PHYSICAL and CHEMICAL PROPERTIES

PHYSICAL STATE:	Solid
APPEARANCE & ODOR:	White granular powder with little or no odor.
ODOR THRESHOLD (PPM):	Not Available
VAPOR PRESSURE (mmHg):	Not Applicable
VAPOR DENSITY (AIR=1):	Not Applicable.
BY WEIGHT:	Not Available
EVAPORATION RATE (nBuAc = 1):	Not Applicable.
BOILING POINT (C°):	Not Applicable.
FREEZING POINT (C°):	Not Applicable.
pH:	9.5 (1% aqueous solution)
SPECIFIC GRAVITY 20°C: (WATER =1)	0.85 – 1.1
SOLUBILITY IN WATER (%)	>10% w/w
COEFFICIENT OF WATER/OIL DIST.:	Not Available
VOC:	None
CHEMICAL FAMILY:	Detergent

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SECTION 10 - STABILITY and REACTIVITY

STABILITY: Product is stable

DECOMPOSITION PRODUCTS: When heated to decomposition this product produces Oxides of carbon (COx)

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong acids and strong oxidizing agents.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Contact with incompatible materials and dust generation.

SECTION 11 - TOXICOLOGICAL INFORMATION

TOXICITY DATA: Toxicity data is available for mixture:

CAS# 497-19-8 LD50 Oral (Rat)	4090 mg/kg
CAS# 497-19-8 LD50 Oral (Mouse)	6600 mg/kg
CAS# 497-19-8 LC50 Inhalation (Rat)	2300 mg/m ³ 2H
CAS# 497-19-8 LC50 Inhalation (Mouse)	1200 mg/m ³ 2H
CAS# 7758-29-4 LD50 Oral (Rat)	3120 mg/kg
CAS# 7758-29-4 LD50 Oral (Mouse)	3100 mg/kg
CAS# 7722-88-5 LD50 Oral (Rat)	4000 mg/kg

SUSPECTED CANCER AGENT: None of the ingredients are found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, IARC and therefore is not considered to be, nor suspected to be a cancer-causing agent by these agencies.

IRRITANCY OF PRODUCT: Contact with this product can be irritating to exposed skin, eyes and respiratory system.

SENSITIZATION OF PRODUCT: This product is not considered a sensitizer.

REPRODUCTIVE TOXICITY INFORMATION: No information concerning the effects of this product and its components on the human reproductive system.

SECTION 12 - ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

ENVIRONMENTAL STABILITY: No Data available at this time.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: No evidence is currently available on this product's effects on plants or animals.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on this product's effects on aquatic life.

SECTION 13 - DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations, those of Canada, Australia, EU Member States and Japan.

SECTION 14 - TRANSPORTATION INFORMATION

US DOT; IATA; IMO; ADR:

THIS PRODUCT IS NOT HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Non-Regulated Material

HAZARD CLASS NUMBER and DESCRIPTION: Not Applicable

UN IDENTIFICATION NUMBER: Not Applicable

PACKING GROUP: Not Applicable.

DOT LABEL(S) REQUIRED: Not Applicable

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2004): Not Applicable

MARINE POLLUTANT: None of the ingredients are classified by the DOT as a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B)

U.S. DEPARTMENT OF TRANSPORTATION (DOT) SHIPPING REGULATIONS:

This product is not classified as dangerous goods, per U.S. DOT regulations, under 49 CFR 172.101.

TRANSPORT CANADA, TRANSPORTATION OF DANGEROUS GOODS REGULATIONS:

This product is not classified as Dangerous Goods, per regulations of Transport Canada.

INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA):

This product is not classified as Dangerous Goods, by rules of IATA:

INTERNATIONAL MARITIME ORGANIZATION (IMO) DESIGNATION:

This product is not classified as Dangerous Goods by the International Maritime Organization.

EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR):

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This product is not classified by the United Nations Economic Commission for Europe to be dangerous goods.

SECTION 15 - REGULATORY INFORMATION

UNITED STATES REGULATIONS

SARA REPORTING REQUIREMENTS: This product is not subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act., as follows: None

TSCA: All components in this product are listed on the US Toxic Substances Control Act (TSCA) inventory of chemicals.

SARA 311/312:

Acute Health: Yes Chronic Health: No Fire: No Reactivity: No

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for this product. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lb (4,540 kg) may apply, per 40 CFR 370.20.

U.S. CERCLA REPORTABLE QUANTITY (RQ): None

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): None of the ingredients are on the California Proposition 65 lists.

CANADIAN REGULATIONS:

CANADIAN DSL/NDL INVENTORY STATUS: All of the components of this product are on the DSL Inventory

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: No component of this product is on the CEPA First Priorities Substance Lists.

CANADIAN WHMIS CLASSIFICATION and SYMBOLS: This product is categorized as a Controlled Product, Hazard Class D2B as per the Controlled Product Regulations

EUROPEAN ECONOMIC COMMUNITY INFORMATION:

EU LABELING AND CLASSIFICATION:

Classification of the mixture according to Regulation (EC) No1272/2008. See section 2 for details.

AUSTRALIAN INFORMATION FOR PRODUCT:

AUSTRALIAN INVENTORY OF CHEMICAL SUBSTANCES (AICS) STATUS: All components of this product are listed on the AICS.

STANDARD FOR THE UNIFORM SCHEDULING OF DRUGS AND POISONS: Not applicable.

JAPANESE INFORMATION FOR PRODUCT:

JAPANESE MINISTER OF INTERNATIONAL TRADE AND INDUSTRY (MITI) STATUS: The components of this product are not listed as Class I Specified Chemical Substances, Class II Specified Chemical Substances, or Designated Chemical Substances by the Japanese MITI.

INTERNATIONAL CHEMICAL INVENTORIES:

Listing of the components on individual country Chemical Inventories is as follows:

Asia-Pac:	Listed
Australian Inventory of Chemical Substances (AICS):	Listed
Korean Existing Chemicals List (ECL):	Listed
Japanese Existing National Inventory of Chemical Substances (ENCS):	Listed
Philippines Inventory of Chemicals and Chemical Substances (PICCS):	Listed
Swiss Giftlist of Toxic Substances:	Listed
U.S. TSCA:	Listed

SECTION 16 - OTHER INFORMATION

PREPARED BY: Paul Eigbrett Global Safety Management, 10006 Cross Creek Blvd. Suite 440, Tampa, FL 33647

MATERIAL SAFETY DATA SHEET

ALCONOX®

Disclaimer: To the best of Alconox, Inc. knowledge, the information contained herein is reliable and accurate as of this date; however, accuracy, suitability or completeness is not guaranteed and no warranties of any type either express or implied are provided. The information contained herein relates only to this specific product.

ANNEX:

IDENTIFIED USES OF ALCONOX® AND DIRECTIONS FOR USE

Used to clean: Healthcare instruments, laboratory ware, vacuum equipment, tissue culture ware, personal protective equipment, sampling apparatus, catheters, tubing, pipes, radioactive contaminated articles, optical parts, electronic components, pharmaceutical apparatus, cosmetics manufacturing equipment, metal castings, forgings and stampings, industrial parts, tanks and reactors. Authorized by USDA for use in federally inspected meat and poultry plants. Passes inhibitory residue test for water analysis. FDA certified.

Used to remove: Soil, grit, grime, buffing compound, slime, grease, oils, blood, tissue, salts, deposits, particulates, solvents, chemicals, radioisotopes, radioactive contaminations, silicon oils, mold release agents.

Surfaces cleaned: Corrosion inhibited formulation recommended for glass, metal, stainless steel, porcelain, ceramic, plastic, rubber and fiberglass. Can be used on soft metals such as copper, aluminum, zinc and magnesium if rinsed promptly. Corrosion testing may be advisable.

Cleaning method: Soak, brush, sponge, cloth, ultrasonic, flow through clean-inplace. Will foam—not for spray or machine use.

Directions: Make a fresh 1% solution (2 1/2 Tbsp. per gal., 1 1/4 oz. per gal. or 10 grams per liter) in cold, warm, or hot water. If available use warm water. Use cold water for blood stains. For difficult soils, raise water temperature and use more detergent. Clean by soak, circulate, wipe, or ultrasonic method. Not for spray machines, will foam. For nonabrasive scouring, make paste. Use 2% solution to soak frozen stopcocks. To remove silver tarnish, soak in 1% solution in aluminum container. RINSE THOROUGHLY—preferably with running water. For critical cleaning, do final or all rinsing in distilled, deionized, or purified water. For food contact surfaces, rinse with potable water. Used on a wide range of glass, ceramic, plastic, and metal surfaces. Corrosion testing may be advisable.



MATERIAL SAFETY DATA SHEET (HYDROCHLORIC ACID)

I. PRODUCT IDENTIFICATION

Chemical Name : Hydrochloric Acid
Trade Name : Technical Grade Muriatic Acid
Synonyms : Muriatic Acid, Spirit of Salts

II. COMPOSITION / INGREDIENTS

Hydrochloric Acid, % : 32 – 34 % by weight
Chemical Formula : HCl
Molecular Weight : 36.46 g/mole
CAS Registry No. : 7647-01-0

III. HAZARDS IDENTIFICATION

THIS PRODUCT MAY BE : corrosive, toxic and a major potential hazard upon contact to skin, eyes and respiratory tract.

TOXICITY ROUTES OF EXPOSURE :

Ingestion can cause severe burns of the mucous membranes of the mouth, esophagus and stomach; pain, nausea and vomiting may also occur.

Inhalation causes irritation of the upper respiratory tract resulting in cough, burning of the throat and choking sensation.

Skin contact to a high concentration of the HCl gas or liquid may cause burns; repeated or prolonged exposures to dilute solutions may cause dermatitis.

Eye exposure to high concentration of the acid can cause eye irritation to severe destruction like prolonged or permanent visual impairment, including blindness. These effects occur rapidly affecting all parts of the eye. Mist can also cause irritation to destructive burns.

OVEREXPOSURE :

Can cause serious damage to all body tissues contacted.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:

Fumes may aggravate eye, skin or respiratory conditions. Effects are usually limited to inflammation and occasionally ulceration of the nose, throat and larynx, if inhaled deeply, pulmonary edema may occur.

IV. FIRST AID MEASURES

SKIN : Remove contaminated clothing and immediately wash skin for a minimum of 15 minutes. Call or see a physician.

EYES : Immediately flush eyes with large amount of water. Occasionally lifting the upper and lower eyelids and rotating the eyeballs. Continue flushing for a minimum of 15 minutes. Call a physician.

INHALATION : Remove to fresh air. If breathing stops, administer artificial respiration. Call a physician.

INGESTION : DO NOT induce vomiting. Rinse or wash mouth with water. If person is conscious, give 2 or more glasses of water. If unconscious, never give anything by mouth. **See a physician immediately.**

V. FIRE FIGHTING MEASURES

Autoignition Point : Not Applicable

Flash Point : Not Applicable

Flammability/Explosive limits : Not Applicable

Fire/Explosion Hazards: Emits toxic and choking fumes of hydrogen chloride. Hydrochloric acid is not flammable but flammable and explosive hydrogen gas may be formed on contact with metals.

Fire Prevention/ Extinguishing Media : Not Applicable

VI. ACCIDENTAL RELEASE MEASURES

IN CASE OF SPILL OR RELEASE :

Move people from the area. Move upwind. Avoid contact with acid. Stop leaks if safe to do so. Reposition container if this will reduce or stop leakage. If leak continues, remove leaking container from vehicle or move other materials from vehicle away from container. Absorb spill with sand or earth. If available, cover the spill with excess soda ash, lime or sodium bicarbonate, otherwise, wash away with large amounts of water. Scoop slurry to plastic drums. If leak cannot be safely stopped or if contents cannot be safely transferred to a sound container, contact fire brigade.

VII. HANDLING AND STORAGE

Storage Requirements: Keep container tightly closed.

FOR SMALL VOLUMES : Maybe stored in plastic jugs, carboys, and plastic drums.

FOR LARGE VOLUMES : Store in rubber-lined or epoxy lined steel storage tanks or fiber glass reinforced polyester (FRP) tanks.

Incompatible Materials: Store away from heat

Use Instructions: Wear suitable protective clothing, gloves and eye/face protection. In case of insufficient ventilation, wear suitable respiratory equipment.



MATERIAL SAFETY DATA SHEET (HYDROCHLORIC ACID)

VIII. EXPOSURE CONTROLS AND PROTECTION

Ventilation: Use only in well-ventilated areas.

Protective Equipment for the eyes and skin :

Splash proof and face shield goggles, disposable latex/ rubber apron, PVC rain suit, rubber boots with pant legs over boots.

Respiratory Protection Requirements: NIOSH/MSHA approved respirator should be used.

Precautionary Hygiene/control measures :

Avoid contact with skin, eyes, and clothing. Do not breathe mist or vapor. Wash thoroughly after handling. Safety showers and eye wash fountains should be available in storage and handling area. Any protective clothing contaminated with hydrochloric acid should be removed immediately and thoroughly laundered before wearing again.

IX. PHYSICAL AND CHEMICAL PROPERTIES

STATE : fuming liquid
APPEARANCE : colorless to slightly yellow
ODOR : Irritating
pH : Strong acid <1
BOILING POINT : 85° C
FLASH POINT : Not determined
SPECIFIC GRAVITY : 1.150 -1.164
VAPOR PRESSURE : 20 hPa @ 20° C
SOLUBILITY IN : WATER: miscible, BASE : miscible

X. STABILITY AND REACTIVITY

Stability : Stable under normal handling conditions.

Hazardous polymerization will not occur.

Hazardous decomposition product: HCl gas will not decompose.

Materials and conditions to avoid (incompatibility) are:

Avoid high temperatures. Containers may burst. Corrosive to most metals, concrete, some plastics, some rubber and coatings. Fumes forms droplets which settle and promote corrosion of metals and unprotected equipment. Mixing with strong acids can cause evolution of hydrogen chloride gas. Oxidizing agents will cause the release of toxic chlorine gas. Contact of liquid acid or gas with alkali or active metal may develop enough heat to cause fire in adjacent combustible material.

XI. TOXICOLOGICAL INFORMATION

Reproductive Effects: No data available

MUTAGENICITY : Not applicable

CANCER INFORMATION : Not applicable

XII. ECOLOGICAL INFORMATION

ECOTOXICITY DATA: High acidity may pose potential hazard to plant and marine life.

WATER-POLLUTION RISK CLASSIFICATION: Slightly water-polluting substance.

XIII. DISPOSAL CONSIDERATIONS

Dispose of in accordance with all Government and Local regulations.

XIV. TRANSPORT INFORMATION

Transportation of Dangerous Goods

TDG Classification: Do not ship by air.

DOT Hazard Classification: Class 8 : Corrosive: Group II

DOT Shipping Name : Hydrochloric acid ID: UN 1789

XV. REGULATORY INFORMATION

No data available

XVI. OTHER INFORMATION

This MSDS contains information under the sixteen (16) section headings required by ISO 11014 "Safety Data Sheet for Chemical Products".

THE INFORMATION CONTAINED HEREIN IS PRESENTED IN GOOD FAITH AND BELIEVED TO CORRECT AS OF THE DATE OF ISSUE. HOWEVER, NO WARRANTY, EXPRESS OR IMPLIED IS GIVEN BY MABUHAY VINYL CORPORATION REGARDING THE USE OF THIS MATERIAL SAFETY DATA SHEET (MSDS).



MATERIAL SAFETY DATA SHEET - CALIBRATION CHECK GAS

PRODUCT NAME: ISOBUTYLENE (1 PPM – 0.9%) IN AIR

MSDS NO: 248

Version:3

Date: March, 2012

1. Chemical Product and Company Identification

Gasco Affiliates, LLC
320 Scarlett Blvd.
Oldsmar, FL 34677

TELEPHONE NUMBER: (800) 910-0051
FAX NUMBER: (866) 755-8920
E-MAIL: info@gascogas.com

24-HOUR EMERGENCY NUMBER: 1-800-424-9300

PRODUCT NAME: ISOBUTYLENE (1 PPM – 0.9%) IN AIR
CHEMICAL NAME: Isobutylene in air
COMMON NAMES/ SYNONYMS: None
TDG (Canada) CLASSIFICATION: 2.2
WHIMIS CLASSIFICATION: A

2. COMPOSITION/ INFORMATION ON INGREDIENTS

INGREDIENT	%VOLUME	PEL-OSHA	TLV-ACGIH	LD ₅₀ or LC ₅₀ Route/Species
Isobutylene FORMULA: C ₄ H ₈	0.0001-0.9	N/A	N/A	N/A
Air FORMULA: Mixture	99.0 to 99.9999	N/A	N/A	N/A

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Release of this product may produce oxygen-deficient atmospheres (especially in confined spaces or other poorly ventilated environments); individuals in such atmospheres may be asphyxiated. Isobutylene may cause drowsiness and other central nervous system effects in high concentrations; however, due to the low concentration of this gas mixture, this is unlikely to occur.

ROUTE OF ENTRY:

Skin Contact No	Skin Absorption No	Eye Contact No	Inhalation Yes	Ingestion No
HEALTH EFFECTS:				
Exposure Limits Yes	Irritant No	Sensitization No	Reproductive Hazard No	Mutagen No

Carcinogenicity: --NTP: No IARC: No OSHA: No

EYE EFFECTS:

N/A.

SKIN EFFECTS:

N/A.



MATERIAL SAFETY DATA SHEET - CALIBRATION CHECK GAS

PRODUCT NAME: ISOBUTYLENE (1 PPM – 0.9%) IN AIR

INGESTION EFFECTS:

Ingestion unlikely. Gas at room temperature.

INHALATION EFFECTS:

Due to the small size of this cylinder, no unusual health effects from over-exposure are anticipated under normal routine use.

NFPA HAZARD CODES

Health: 1
Flammability: 0
Reactivity: 0

HMIS HAZARD CODES

Health: 1
Flammability: 0
Reactivity: 0

RATING SYSTEM

0= No Hazard
1= Slight Hazard
2= Moderate Hazard
3= Serious Hazard
4= Severe Hazard

4. FIRST AID MEASURES

EYES:

N/A

SKIN:

N/A

INGESTION:

Not required

INHALATION:

PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH THE SELF-CONTAINED BREATHING APPARATUS. Victims should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. If breathing has stopped administer artificial resuscitation and supplemental oxygen. Further treatment should be symptomatic and supportive.

5. FIRE-FIGHTING MEASURES

These containers hold gas under pressure, with no liquid phase. If involved in a major fire, they should be sprayed with water to avoid pressure increases, otherwise pressures will rise and ultimately they may distort or burst to release the contents. The gases will not add significantly to the fire, but containers or fragments may be projected considerable distances - thereby hampering fire fighting efforts.

6. ACCIDENTAL RELEASE MEASURES

In terms of weight, these containers hold very little contents, such that any accidental release by puncturing etc. will be of no practical concern.

7. HANDLING AND STORAGE

Suck back of water into the container must be prevented. Do not allow backfeed into the container. Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Use only in well-ventilated areas. Do not heat cylinder by any means to increase rate of product from the cylinder. Do not allow the temperature where cylinders are stored to exceed 130°F (54°C).

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Use adequate ventilation for extended use of gas.



MATERIAL SAFETY DATA SHEET - CALIBRATION CHECK GAS

PRODUCT NAME: ISOBUTYLENE (1 PPM – 0.9%) IN AIR

9. PHYSICAL AND CHEMICAL PROPERTIES

PARAMETER:	VALUE:
Physical state	: Gas
Evaporation point	: N/A
pH	: N/A
Odor and appearance	: Colorless, odorless gas

10. STABILITY AND REACTIVITY

Stable under normal conditions. Expected shelf life 48 months.

11. TOXICOLOGICAL INFORMATION

No toxicological damage caused by this product.

12. ECOLOGICAL INFORMATION

No ecological damage caused by this product.

13. DISPOSAL INFORMATION

Do not discharge into any place where its accumulation could be dangerous. Used containers are acceptable for disposal in the normal waste stream as long as the cylinder is empty and valve removed or cylinder wall is punctured; but GASCO encourages the consumer to return cylinders.

14. TRANSPORT INFORMATION

	<u>United States DOT</u>	<u>Canada TDG</u>
PROPER SHIPPING NAME:	Compressed Gas N.O.S. (Isobutylene in Air)	Compressed Gas N.O.S. (Isobutylene in Air)
HAZARD CLASS:	2.2	2.2
IDENTIFICATION NUMBER:	UN1956	UN1956
SHIPPING LABEL:	NONFLAMMABLE GAS	NONFLAMMABLE GAS

15. REGULATORY INFORMATION

Isobutylene is listed under the accident prevention provisions of section 112(r) of the Clean Air Act (CAA) with a threshold quantity (TQ) of 10,000 pounds.

16. OTHER INFORMATION

This MSDS has been prepared in accordance with the Chemicals (Hazard Information and Packaging for Supply (Amendment) Regulation 1996. The information is based on the best knowledge of GASCO, and its advisors and is given in good faith, but we cannot guarantee its accuracy, reliability or completeness and therefore disclaim any liability for loss or damage arising out of use of this data. Since conditions of use are outside the control of the Company and its advisors we disclaim any liability for loss or damage when the product is used for other purposes than it is intended.

MSDS/S010/248/ March, 2012

Portland Cement Based Concrete Products

MATERIAL SAFETY DATA SHEET (Complies with OSHA 29 CFR 1910.1200)

SECTION I: PRODUCT IDENTIFICATION

The QUIKRETE® Companies
One Securities Centre
3490 Piedmont Road, Suite 1300
Atlanta, GA 30329

Emergency Telephone Number
(770) 216-9580

Information Telephone Number
(770) 216-9580

MSDS J1
Revision: May-12

QUIKRETE® Product Name

Code #

CONCRETE MIX	1101
FENCE POST MIX	1005
FIBER-REINFORCED CONCRETE MIX	1006
CRACK RESISTANT CONCRETE MIX	1006-80
QUIKRETE 5000 CONCRETE MIX	1007
QUIKRETE 6000 CONCRETE MIX	1007
LIGHTWEIGHT CONCRETE MIX	1008
HANDICRETE CONCRETE MIX	1141
MAXIMUM YIELD CONCRETE MIX	1100-80
B-CRETE	1101-81
PRO-FINISH QUIKRETE 5000	1007-85
BASIC CONCRETE MIX	1015
RIP RAP	1129
ALL-STAR CONCRETE MIX	1121
ALL-STAR CRACK RESISTANT CONCRETE MIX	1470-03
ALL-STAR 5000 CONCRETE MIX	1470-01
RED-E-CRETE CONCRETE MIX	1101-91, -87
RIP RAP SCRIM	1134-80
FIBER REINFORCED DECK MIX	1251-80, -81
PRO-FINISH CRACK RESISTANT CONCRETE MIX	1006-68
COUNTERTOP MIX	1106-80
RITE MIX CONCRETE	1171-60
GREEN CONCRETE MIX	1101-63, -73



Product Use: Portland cement-based, aggregated products for general construction

SECTION II - HAZARD IDENTIFICATION

Route(s) of Entry: Inhalation, Skin, Ingestion

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Acute Exposure: Product becomes alkaline when exposed to moisture. Exposure can dry the skin, cause alkali burns and affect the mucous membranes. Dust can irritate the eyes and upper respiratory system. Toxic effects noted in animals include, for acute exposures, alveolar damage with pulmonary edema.

Chronic Exposure: Dust can cause inflammation of the lining tissue of the interior of the nose and inflammation of the cornea. Hypersensitive individuals may develop an allergic dermatitis.

Carcinogenicity: Since Portland cement and blended cements are manufactured from raw materials mined from the earth (limestone, marl, sand, shale, etc.) and process heat is provided by burning fossil fuels, trace, but detectable, amounts of naturally occurring, and possibly harmful, elements may be found during chemical analysis. Under ASTM standards, Portland cement may contain 0.75 % insoluble residue. A fraction of these residues may be free crystalline silica. Respirable crystalline silica (quartz) can cause silicosis, a fibrosis (scarring) of the lungs and possibly cancer. There is evidence that exposure to respirable silica or the disease silicosis is associated with an increased incidence of Scleroderma, tuberculosis and kidney disorders.

Carcinogenicity Listings:

NTP:	Known carcinogen
OSHA:	Not listed as a carcinogen
IARC Monographs:	Group 1 Carcinogen
California Proposition 65:	Known carcinogen

NTP: The National Toxicology Program, in its "Ninth Report on Carcinogens" (released May 15, 2000) concluded that "Respirable crystalline silica (RCS), primarily quartz dusts occurring in industrial and occupational settings, is *known to be a human carcinogen*, based on sufficient evidence of carcinogenicity from studies in humans indicating a causal relationship between exposure to RCS and increased lung cancer rates in workers exposed to crystalline silica dust (reviewed in IAC, 1997; Brown *et al.*, 1997; Hind *et al.*, 1997)

IARC: The International Agency for Research on Cancer ("IARC") concluded that there was "*sufficient evidence* in humans for the carcinogenicity of crystalline silica in the forms of quartz or cristobalite from occupational sources", and that there is "*sufficient evidence* in experimental animals for the carcinogenicity of quartz or cristobalite." The overall IARC evaluation was that "crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is *carcinogenic to humans* (Group 1)." The IARC evaluation noted that "carcinogenicity was not detected in all industrial circumstances or studies. Carcinogenicity may be dependent on inherent characteristics of the crystalline silica or on external factors affecting its biological activity or distribution of its polymorphs." For further information on the IARC evaluation, see IARC Monographs on the Evaluation of carcinogenic Risks to Humans, Volume 68, "Silica, Some Silicates." (1997)

Signs and Symptoms of Exposure: Symptoms of excessive exposure to the dust include shortness of breath and reduced pulmonary function. Excessive exposure to skin and eyes especially when mixed with water can cause caustic burns as severe as third degree.

Medical Conditions Generally Aggravated by Exposure: Individuals with sensitive skin and with pulmonary and/or respiratory disease, including, but not limited to, asthma and bronchitis, or subject to eye irritation, should be precluded from exposure. Exposure to crystalline silica or the disease silicosis is associated with increased incidence of scleroderma, Tuberculosis and possibly increased incidence of kidney lesions.

Chronic Exposure: Dust can cause inflammation of the lining tissue of the interior of the nose and inflammation of the cornea. Hypersensitive individuals may develop an allergic dermatitis. (May contain trace (<0.05 %) amounts of chromium salts or compounds including hexavalent chromium, or other metals found to be hazardous or toxic in some chemical forms. These metals are mostly present as trace substitutions within the principal minerals)

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Medical Conditions Generally Aggravated by Exposure: Individuals with sensitive skin and with pulmonary and/or respiratory disease, including, but not limited to, asthma and bronchitis, or subject to eye irritation, should be precluded from exposure.

SECTION III - HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

Hazardous Components	CAS No.	%	PEL (OSHA) mg/M ³	TLV (ACGIH) mg/M ³
Portland Cement	65997-15-1	10-30	5	5
Lime	01305-62-0	0-5	5	5
Silica Sand, crystalline	14808-60-7	70-90	<u>10</u> %SiO ₂ +2	0.05 (respirable)

May contain one or more of the following ingredients:

Amorphous Silica (From fly Ash)	07631-86-9	<u>80</u> %SiO ₂ +2	10
Alumina (From Fly Ash)	01344-28-1	5	5
Limestone Dust	01317-65-3	5	5
Calcium Sulfate	10101-41-4 or 13397-24-5	5	5

Other Limits: National Institute for Occupational Safety and Health (NIOSH). Recommended standard maximum permissible concentration=0.05 mg/M³ (respirable free silica) as determined by a full-shift sample up to 10-hour working day, 40-hour work week. See NIOSH Criteria for a Recommended Standard Occupational Exposure to Crystalline Silica.

SECTION IV – First Aid Measures

Eyes: Immediately flush eye thoroughly with water. Continue flushing eye for at least 15 minutes, including under lids, to remove all particles. Call physician immediately.

Skin: Wash skin with cool water and pH-neutral soap or a mild detergent. Seek medical treatment if irritation or inflammation develops or persists. Seek immediate medical treatment in the event of burns.

Inhalation: Remove person to fresh air. If breathing is difficult, administer oxygen. If not breathing, give artificial respiration. Seek medical help if coughing and other symptoms do not subside. Inhalations of large amounts of Portland cement require immediate medical attention.

Ingestion: Do not induce vomiting. If conscious, have the victim drink plenty of water and call a physician immediately.

SECTION V - FIRE AND EXPLOSION HAZARD DATA

Flammability: Noncombustible and not explosive.

Auto-ignition Temperature: Not Applicable

Flash Points: Not Applicable

SECTION VI – ACCIDENTAL RELEASE MEASURES

If spilled, use dustless methods (vacuum) and place into covered container for disposal (if not contaminated or wet). Use adequate ventilation to keep exposure to airborne contaminants below the exposure limit.

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SECTION VII - PRECAUTIONS FOR SAFE HANDLING AND STORAGE

Do not allow water to contact the product until time of use. DO NOT BREATHE DUST. In dusty environments, the use of an OSHA, MSHA or NIOSH approved respirator and tight fitting goggles is recommended.

SECTION VIII – EXPOSURE CONTROL MEASURES

Engineering Controls: Local exhaust can be used, if necessary, to control airborne dust levels.

Personal Protection: The use of barrier creams or impervious gloves, boots and clothing to protect the skin from contact is recommended. Following work, workers should shower with soap and water. Precautions must be observed because burns occur with little warning -- little heat is sensed.

WARN EMPLOYEES AND/OR CUSTOMERS OF THE HAZARDS AND REQUIRED OSHA PRECAUTIONS ASSOCIATED WITH THE USE OF THIS PRODUCT.

Exposure Limits: Consult local authorities for acceptable exposure limits

SECTION IX - PHYSICAL/CHEMICAL CHARACTERISTICS

Appearance: Gray to gray-brown colored powder; Some products contain coarse aggregates.

Specific Gravity: 2.6 to 3.15

Melting Point: >2700°F

Boiling Point: >2700°F

Vapor Pressure: Not Available

Vapor Density: Not Available

Evaporation Rate: Not Available

Solubility in Water: Slight

Odor: Not Available

pH: 13 (10%)

Volatile Organic Content (VOC): 0 g/L

SECTION X - REACTIVITY DATA

Stability: Stable.

Incompatibility (Materials to Avoid): Contact of silica with powerful oxidizing agents such as fluorine, chlorine trifluoride, manganese trioxide, or oxygen difluoride may cause fires

Hazardous Decomposition or By-products: Silica will dissolve in Hydrofluoric Acid and produce a corrosive gas – silicon tetrafluoride.

Hazardous Polymerization: Will Not Occur.

Condition to Avoid: Keep dry until used to preserve product utility.

SECTION XI – TOXICOLOGICAL INFORMATION

Routes of Entry: Inhalation, Ingestion

Toxicity to Animals:

LD50: Not Available

LC50: Not Available

Chronic Effects on Humans: Conditions aggravated by exposure include eye disease, skin disorders and Chronic Respiratory conditions.

Special Remarks on Toxicity: Not Available

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SECTION XII – ECOLOGICAL INFORMATION

Ecotoxicity: Not Available

BOD5 and COD: Not Available

Products of Biodegradation: Not available

Toxicity of the Products of Biodegradation: Not available

Special Remarks on the Products of Biodegradation: Not available

SECTION XIII – DISPOSAL CONSIDERATIONS

Waste Disposal Method: The packaging and material may be land filled; however, material should be covered to minimize generation of airborne dust. This product is not classified as a hazardous waste under the authority of the RCRA (40CFR 261) or CERCLA (40CFR 117&302).

SECTION XIV – TRANSPORT INFORMATION

Not hazardous under U.S. DOT and TDG regulations.

SECTION XV – OTHER REGULATORY INFORMATION

US OSHA 29CFR 1910.1200: Considered hazardous under this regulation and should be included in the employers' hazard communication program

SARA (Title III) Sections 311 & 312: Qualifies as a hazardous substance with delayed health effects

SARA (Title III) Section 313: Not subject to reporting requirements

TSCA (May 1997): Some substances are on the TSCA inventory list

Federal Hazardous Substances Act: Is a hazardous substance subject to statutes promulgated under the subject act

California Regulation: WARNING: This product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

Canadian Environmental Protection Act: Not listed

Canadian WHMIS Classification: Considered to be a hazardous material under the Hazardous Products Act as defined by the Controlled Products Regulations (Class D2A, E- Corrosive Material) and subject to the requirements of Health Canada's Workplace Hazardous Material Information (WHMIS). This product has been classified according to the hazard criteria of the Controlled Products Regulation (CPR). This document complies with the WHMIS requirements of the Hazardous Products Act (HPA) and the CPR.

SECTION XVI – OTHER INFORMATION

HMIS-III:	Health –	0 = No significant health risk
		1 = Irritation or minor reversible injury possible
		2 = Temporary or minor injury possible
		3 = Major injury possible unless prompt action is taken
		4 = Life threatening, major or permanent damage possible
Flammability-	0 = Material will not burn	
	1 = Material must be preheated before ignition will occur	
	2 = Material must be exposed to high temperatures before ignition	

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Physical Hazard-	3 = Material capable of ignition under normal temperatures
	4 = Flammable gases or very volatile liquids; may ignite spontaneously
	0 = Material is normally stable, even under fire conditions
	1 = Material normally stable but may become unstable at high temps
	2 = Materials that are unstable and may undergo react at room temp
	3 = Materials that may form explosive mixtures with water
	4 = Materials that are readily capable of explosive water reaction

Abbreviations:

ACGIH	American Conference of Government Industrial Hygienists
CAS	Chemical Abstract Service
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CPR	Controlled Products Regulations (Canada)
DOT	Department of Transportation
IARC	International Agency for Research
MSHA	Mine Safety and Health Administration
NIOSH	National Institute for Occupational Safety and Health
NTP	National Toxicity Program
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
RCRA	Resource Conservation and Recovery Act
SARA	Superfund Amendments and Reauthorization Act
TLV	Threshold Limit Value
TWA	Time-weighted Average
WHMIS	Workplace Hazardous Material Information System

Last Updated: May 8, 2012

NOTE: The information and recommendations contained herein are based upon data believed to be correct. However, no guarantee or warranty of any kind, express or implied, is made with respect to the information contained herein. We accept no responsibility and disclaim all liability for any harmful effects which may be caused by exposure to silica contained in our products. END OF MSDS.

THA

PRE-WORK THA

Page 1 of 5

THA Title:	Vapor Intrusion Response Action Plan	Date:	04/02/2014
Project Name:	Operable Unit 2 North Penn Area 5 Superfund Site	Client Name:	Stabilus, Inc.
Project Number:	PH0055	Client Project Manager:	Craig Pospiech
Project Location:	Colmar, PA	Geosyntec Project Manager:	Derek Tomlinson
Scope of Work Summary:	Vapor Intrusion work including building survey and sub-slab sampling point installation and sampling		
Work Steps	Process or Activity	Hazards	Hazard Control
1) Survey buildings		Hazards associated with working in unknown work environment. Hazards include heavy equipment, overhead equipment, unidentified chemicals, risk of trip and fall.	Required PPE of hardhat, safety glasses, and steel-toe boots must be worn at all times.
2) Sub-slab installation and sampling		Injury related to use of hand-power tools. Auditory hazard when working in close proximity of power tools. Hazard of working with pressurized gasses. Caution when hand drilling through slab.	Required PPE must be worn at all times. Work gloves must be worn when operating power tools. Ear plugs worn when in close proximity of power tools. Locations where drilling will occur requires a thorough inspection for all potential utilities.
Required Personal Protective Equipment (PPE):	Hardhats, safety glasses, steel-toe boots, safety vest. Required PPE is to be worn at all times on-Site.		
Work-specific PPE	Earplugs, work gloves, nitrile gloves, weather-appropriate gear. Work-specific PPE is to be worn when performing specific work steps, as described above		

Individuals Must Sign a Separate the last page of this THA after review.

HAZARD		HAZARD CONTROLS (check all that apply and comment as required)
WALKING/WORKING SURFACES (EHS 210, 501)		
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Uneven terrain <input checked="" type="checkbox"/> Slippery surfaces	<input checked="" type="checkbox"/> Walkways are cleared of equipment, vegetation, excavated material, tools and debris <input type="checkbox"/> Pits and floor openings are covered or otherwise guarded <input type="checkbox"/> Work areas are illuminated adequately; field operations are not conducted before sunrise or after sunset unless adequate lighting is provided. <input type="checkbox"/> Spills are cleaned up promptly <input type="checkbox"/> Salt applied to icy areas, snow cleared from walkways
<input type="checkbox"/>	LADDERS / STAIRS <input type="checkbox"/> Extension Ladders <input type="checkbox"/> Step Ladders <input type="checkbox"/> Fixed Ladders <input type="checkbox"/> Stairs	<input type="checkbox"/> Employees trained in safe ladder use at safety meeting <input type="checkbox"/> Extension ladders are properly footed, secured at top, and setup at proper angle <input type="checkbox"/> Stepladders are set on level ground or properly shimmed with spreaders locked. <input type="checkbox"/> Stairs have proper rise over run and stairs >4 steps or 4' have guardrails. <input type="checkbox"/> Ladders/Stairs Comments: <input type="checkbox"/> Never use a step ladder as a straight ladder. All straight ladders shall be extended three rungs past leading edge. Never use metal ladders while working with electricity.
<input type="checkbox"/>	MANLIFT used to reach work <input type="checkbox"/> Scissor Lift <input type="checkbox"/> Extensible Boom <input type="checkbox"/> Articulated Boom <input type="checkbox"/> vertical Lift ("Genie")	<input type="checkbox"/> Operators are sufficiently trained, experienced and qualified. <input type="checkbox"/> Equipment is inspected after mobilization and is in good condition. <input type="checkbox"/> Harness & Lanyard worn whenever operating the lift (scissor lifts may be excepted) <input type="checkbox"/> Overhead and surface obstructions are reviewed with operators prior to use. Manlift Comments:

EXCAVATIONS / TRENCHING/UNDERGROUND HAZARDS (EHS 402)		
<input type="checkbox"/>	<input type="checkbox"/> Max Depth ≥ 20' <input type="checkbox"/> Max Depth ≥ 5' <input type="checkbox"/> Max Depth <5' with potential cave-in hazard <input type="checkbox"/> Potential permit-required confined space at depth ≥ 4' <input type="checkbox"/> Underground utilities <input type="checkbox"/> Structures/foundations <input type="checkbox"/> Falls into excavations	<input type="checkbox"/> Sloping & shoring for excavations ≥20' are approved by a professional engineer <input type="checkbox"/> Sloping & shoring for excavations ≥5' when persons are exposed to cave-in. (specify below) <input type="checkbox"/> Sloping & shoring for shallow (<5') excavations with cave-in hazard (specify below) <input type="checkbox"/> Excavations ≥ 4' are classified as a non-permit confined space <input type="checkbox"/> Excavations ≥ 4' are classified as Alternate Entry or Permit-Required (see confined space) <input type="checkbox"/> Underground utilities have been identified and marked. <input type="checkbox"/> Local "dig safe" organization has been notified for utility locations in public areas or rights of way. Number: _____ Date: _____ <input type="checkbox"/> Hand digging within 3' of utility locations. <input type="checkbox"/> Excavations are protected by perimeter fencing (not barricade tape): <input type="checkbox"/> rigid fence - chain link or wood, safety fence 6' from edge.) Excavation Comments:
CONFINED SPACES (EHS 118)		
<input type="checkbox"/>	<input type="checkbox"/> No <u>Serious</u> Hazards <input type="checkbox"/> Toxic atmosphere <input type="checkbox"/> carbon monoxide <input type="checkbox"/> hydrogen sulfide <input type="checkbox"/> <input type="checkbox"/> Flammable atmosphere <input type="checkbox"/> Low oxygen <input type="checkbox"/> Combustible dust <input type="checkbox"/> Other Serious Hazard:	<input type="checkbox"/> Confined space is altered so that it is no longer a confined space. (describe below) <input type="checkbox"/> Confined space is downgraded to a non-permit confined space. (identify which spaces below) <input type="checkbox"/> Alternate Entry is used. (Identify which space qualify for confined space entry below) <input type="checkbox"/> Full permit-required confined space entry is used due to presence of serious hazards. <input type="checkbox"/> Rescue team has been notified (<input type="checkbox"/> Paid FD <input type="checkbox"/> Volunteer FD <input type="checkbox"/> Plant Rescue) Rescue Team: _____ Phone Number: _____ <input type="checkbox"/> All entrants and attendants for Alternate Entry and Permit-Required Entry have confined space entry training. Confined Space Comments:
BOAT OPERATIONS/WORKING ON or NEAR WATER and ICE (EHS 306)		
<input type="checkbox"/>	<input type="checkbox"/> Drowning <input type="checkbox"/> Hypothermia	<input type="checkbox"/> Only qualified employees are operating the boat <input type="checkbox"/> Coast Guard-approved Personal Flotation Device (PFD), sized and adjusted to the wearer, are worn by all when involved in boat operations. <input type="checkbox"/> A float plan is completed prior to leaving dock. <input type="checkbox"/> Emergency equipment like ring buoy, flares and fire extinguishers are present Boat, water operations Comments:
HEAVY EQUIPMENT (other than cranes)		
<input type="checkbox"/>	Struck By, Run-Over, Caught In Between (pinch points), Roll Over, Fluid Leaks <input type="checkbox"/> Bulldozer <input type="checkbox"/> Excavator <input type="checkbox"/> Front Loader <input type="checkbox"/> mini Skid Steer (bobcat) <input type="checkbox"/> mini Excavator <input type="checkbox"/> Dump Truck <input type="checkbox"/> Drill/Boring Rig <input type="checkbox"/> Lull / Material Handler <input type="checkbox"/> Forklift <input type="checkbox"/> Manlift - specify type(s) <input type="checkbox"/> Land Clearing loader	<input type="checkbox"/> Qualified persons operate all heavy equipment. (certificate is required for forklift and lull operators) <input type="checkbox"/> Equipment will be inspected upon mobilization <input type="checkbox"/> All leaks or defective safety equipment will be repaired before use. <input type="checkbox"/> Operators will be reminded of seatbelt use by: _____ <input type="checkbox"/> Eye contact with the operator is made prior to approaching near equipment or swing radius <input type="checkbox"/> High visibility vests are required <input type="checkbox"/> Max. safe slope for each vehicle will be followed <input type="checkbox"/> Counterweight swing radius will be barricaded. <input type="checkbox"/> Operators and helpers will maintain a safe distance to moving parts. All those working near moving or rotating parts will secure loose hair, clothing, and equipment. <input type="checkbox"/> Drill rigs will only be moved with masts lowered. Masts will be erected with outriggers fully extended when equipped with outriggers. <input type="checkbox"/> Rigging directly to the forks of a lull, forklift, or front loader equipped forks is prohibited. Crane hook attachments will be used (specify): _____ Spill equipment is available for fuel and hydraulic fluid leaks. Spill Kit in Vehicle _____
ENVIRONMENTAL HAZARDS (NON CHEMICAL) (EHS 124, 125, 127)		
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Heat Stress <input checked="" type="checkbox"/> Cold Stress <input type="checkbox"/> Insects, spiders, ticks <input type="checkbox"/> Wild animals <input type="checkbox"/> Mold, fungi <input type="checkbox"/> Poisonous plants <input checked="" type="checkbox"/> Hazardous noise	<input checked="" type="checkbox"/> Heat/Cold stress are monitored in accordance with Geosyntec procedures EHS 124 & EHS 125 <input checked="" type="checkbox"/> Fluids are provided to prevent worker dehydration <input type="checkbox"/> Types and injury potential of snakes, insects, spiders are reviewed with workers <input type="checkbox"/> Insect repellent is used, PPE is used to protect against sting/bite injuries. <input type="checkbox"/> All potentially poisonous plants such as poison ivy, poison oak, poison sumac are identified, long sleeve shirt or Tyvek is worn or a barrier cream is used when near these plants <input checked="" type="checkbox"/> Hearing protection is used when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)

2014.04.02

EMERGENCY RESPONSE (911 Service is Available <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No)			
Emergency Medical Treatment - Hospital Name:	Doylestown Hospital	Number:	(215) 345-2200
Hospital Address:	595 West State Street, Doylestown, PA, 18901		
Non-Emergency Med. Treatment - Clinic Name:	Advanced Urgent Care	Number:	(267) 263-2298
Occupational Clinic Address:	721 Bethlehem Pike, Montgomeryville, PA, 18936		
Fire Department Name	Chalfont Fire Department	Number:	(215) 348-3524
Spill Response:		Number:	
Client Representative Name::	M. Joel Bolstein	Office Number:	(215) 918-3555
		Cell Number:	(267) 880-2655
Geosyntec Project Manager Name:	Derek Tomlinson	Office Number:	(267) 464-2800
		Cell Number:	(267) 218-0835
Geosyntec Corporate H&S Name:	Dale Prokopchak	Office Number:	(804) 332-6376
		Cell Number:	(804) 349-8067
Emergency Response Comments:			
Date:			
Project Name:	Operable Unit 2 North Penn Area 5 Superfund Site		
THA Title:	Vapor Intrusion Response Action Plan		
Subcontractor Name:			
Geosyntec Representative (reviewed by):			
Subcontractor Foreman/Supervisor Signature (authorize):			
Crew Signatures (acknowledge):			
Print Name	Signature		
<p>PLEASE RETURN A COPY OF THIS SIGNED PAGE TO GEOSYNTEC PROJECT MGR., SUPERINTENDENT UPON REVIEW AND ACKNOWLEDGMENT BY THE CREW MEMBERS. ALL NEW CREW MEMBERS SHALL BE ORIENTATED THE SAME AND A SUBMITTAL OF A NEW SIGN IN SHEET SHALL BE COMPLETED.</p>			

APPENDIX C

Building Information Form

BUILDING INFORMATION FORM

Preparer's name: _____ Date: _____

Preparer's affiliation: _____ Phone #: _____

Site Name: _____ Case #: _____

Part I - Occupants

Building Address: _____

Property Contact: _____ Owner / Renter / other: _____

Contact's Phone: home () _____ work () _____ cell () _____

of Building occupants: Children under age 13 _____ Children age 13-18 _____ Adults _____

Part II – Building Characteristics

Building type: residential / multi-family residential / office / strip mall / commercial / industrial

Describe building: _____ Year constructed: _____

Sensitive population: day care / nursing home / hospital / school / other (specify): _____

Number of floors below grade: _____ (full basement / crawl space / slab on grade)

Number of floors at or above grade: _____

Depth of basement below grade surface: _____ ft. Basement size: _____ ft²

Basement floor construction: concrete / dirt / floating / stone / other (specify): _____

Foundation walls: poured concrete / cinder blocks / stone / other (specify) _____

Basement sump present? *Yes / No* Sump pump? *Yes / No* Water in sump? *Yes / No*

Type of heating system (circle all that apply):

hot air circulation

hot air radiation

wood

steam radiation

heat pump

hot water radiation

kerosene heater

electric baseboard

other (specify): _____

Type of ventilation system (circle all that apply):

central air conditioning

mechanical fans

bathroom ventilation fans individual air

conditioning units

kitchen range hood fan

outside air intake

other (specify): _____

Type of fuel utilized (circle all that apply):

Natural gas / electric / fuel oil / wood / coal / solar / kerosene

Are the basement walls or floor sealed with waterproof paint or epoxy coatings? *Yes / No*

Is there a whole house fan? *Yes / No*

Septic system? *Yes / Yes (but not used) / No*

Irrigation/private well? *Yes / Yes (but not used) / No*

Type of ground cover outside of building: grass / concrete / asphalt / other (specify) _____

Existing subsurface depressurization (radon) system in place? *Yes / No* *active / passive*

Sub-slab vapor/moisture barrier in place? *Yes / No*
 Type of barrier: _____

Part III - Outside Contaminant Sources

NJDEP contaminated site (1000-ft. radius): _____

Other stationary sources nearby (gas stations, emission stacks, etc.): _____

Heavy vehicular traffic nearby (or other mobile sources): _____

Part IV – Indoor Contaminant Sources

Identify all potential indoor sources found in the building (including attached garages), the location of the source (floor and room), and whether the item was removed from the building 48 hours prior to indoor air sampling event. Any ventilation implemented after removal of the items should be completed at least 24 hours prior to the commencement of the indoor air sampling event.

Potential Sources	Location(s)	Removed (Yes / No / NA)
Gasoline storage cans		
Gas-powered equipment		
Kerosene storage cans		
Paints / thinners / strippers		
Cleaning solvents		
Oven cleaners		
Carpet / upholstery cleaners		
Other house cleaning products		
Moth balls		
Polishes / waxes		
Insecticides		
Furniture / floor polish		
Nail polish / polish remover		
Hairspray		
Cologne / perfume		
Air fresheners		
Fuel tank (inside building)		NA
Wood stove or fireplace		NA
New furniture / upholstery		
New carpeting / flooring		NA
Hobbies - glues, paints, etc.		

Part V – Miscellaneous Items

Do any occupants of the building smoke? *Yes / No* How often? _____

Last time someone smoked in the building? _____ hours / days ago

Does the building have an attached garage directly connected to living space? *Yes / No*

If so, is a car usually parked in the garage? *Yes / No*

Are gas-powered equipment or cans of gasoline/fuels stored in the garage? *Yes / No*

Do the occupants of the building have their clothes dry cleaned? *Yes / No*

If yes, how often? weekly / monthly / 3-4 times a year

Do any of the occupants use solvents in work? *Yes / No*

If yes, what types of solvents are used? _____

If yes, are their clothes washed at work? *Yes / No*

Have any pesticides/herbicides been applied around the building or in the yard? *Yes / No*

If so, when and which chemicals? _____

Has there ever been a fire in the building? *Yes / No* If yes, when? _____

Has painting or staining been done in the building in the last 6 months? *Yes / No*

If yes, when _____ and where? _____

Part VI – Sampling Information

Sample Technician: _____ Phone number: () _____ - _____

Sample Source: Indoor Air / Sub-Slab / Near Slab Soil Gas / Exterior Soil Gas

Sampler Type: Tedlar bag / Sorbent / Stainless Steel Canister / Other (specify): _____

Analytical Method: TO-15 / TO-17 / other: _____ Cert. Laboratory: _____

Sample locations (floor, room):

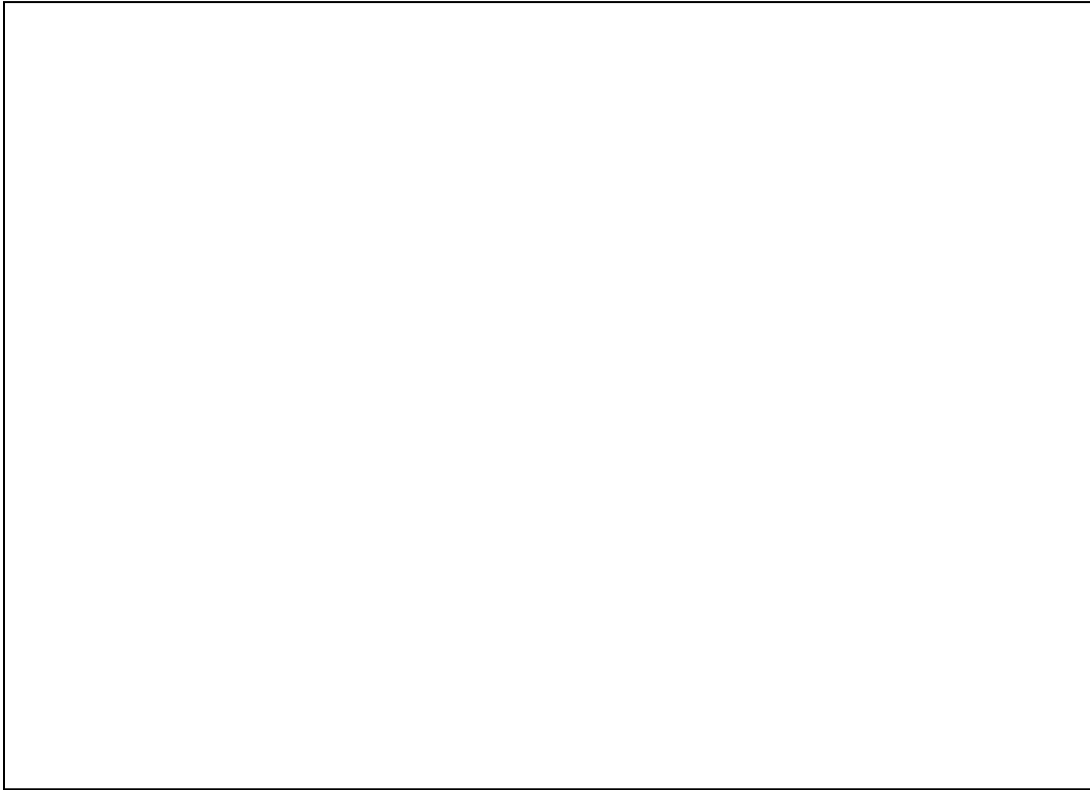
Field ID # _____ - _____ Field ID # _____ - _____

Field ID # _____ - _____ Field ID # _____ - _____

Were “Instructions for Occupants” followed? *Yes / No*

If not, describe modifications: _____

Provide Drawing of Sample Location(s) in Building



Part VII - Meteorological Conditions

Was there significant precipitation within 12 hours prior to (or during) the sampling event? *Yes / No*

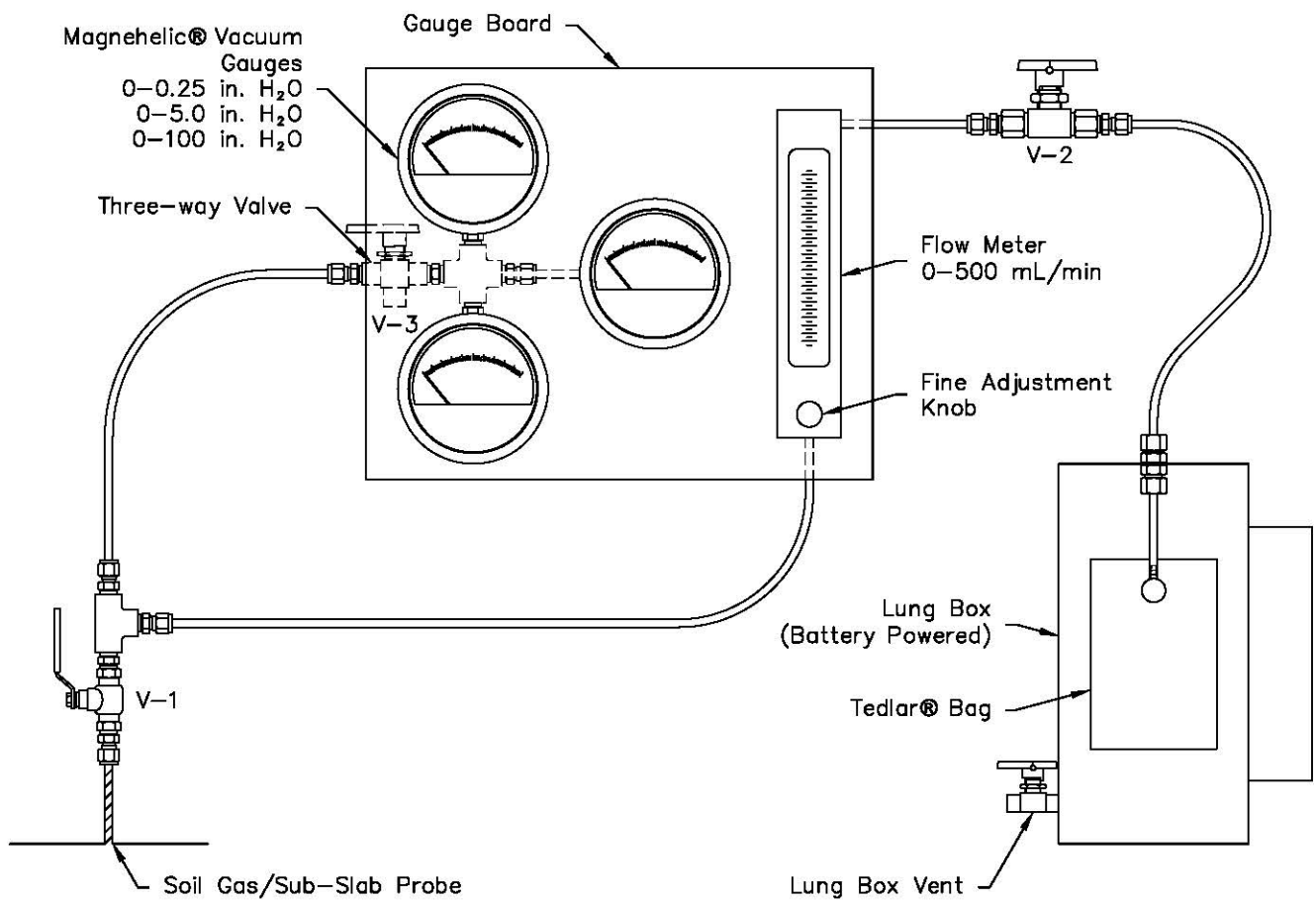
Describe the general weather conditions: _____

Part VIII – General Observations


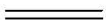
Provide any information that may be pertinent to the sampling event and may assist in the data interpretation process.

APPENDIX D

Soil Gas Sampling Testing Equipment



Legend

-  New Nylaflow® Tubing
-  Non-Dedicated Tubing

Pneumatic Testing Assembly

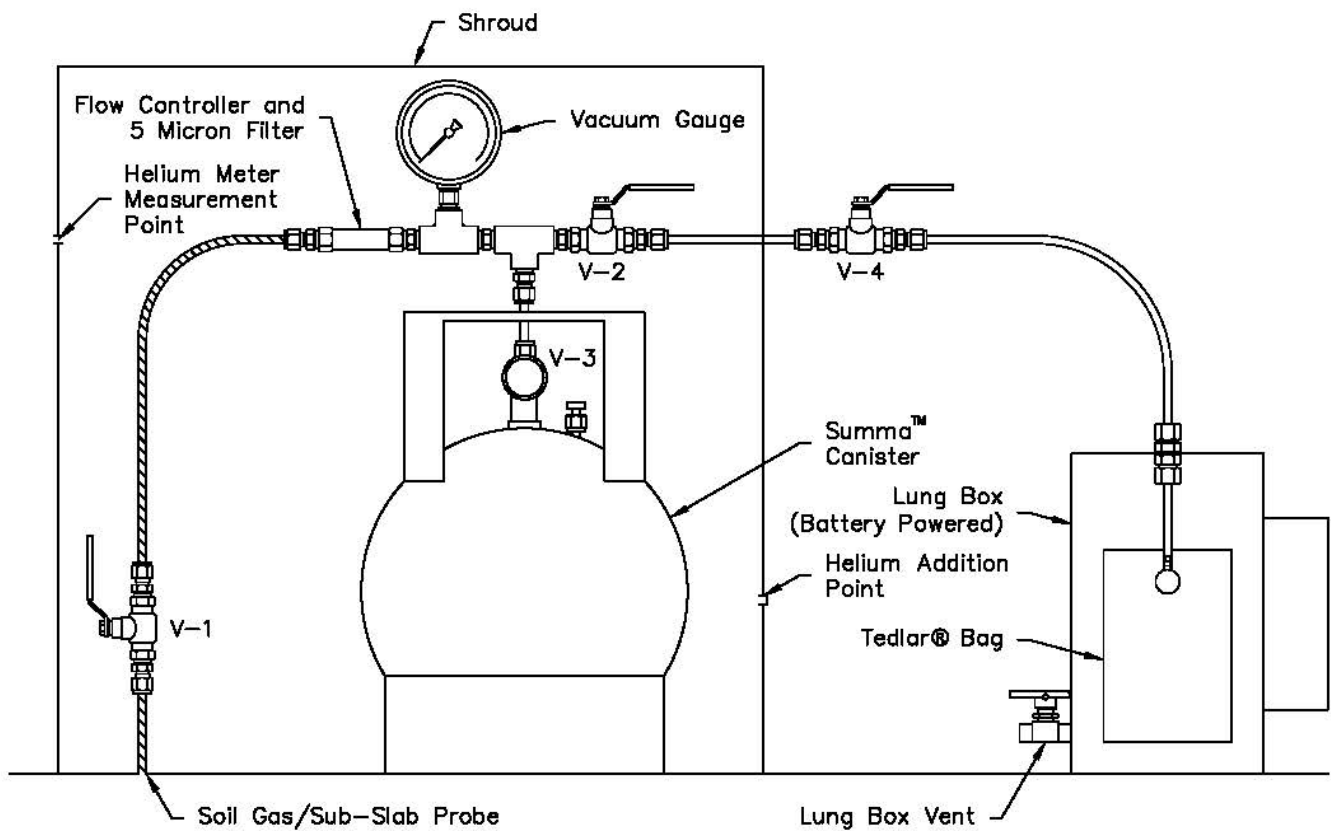
Geosyntec
 consultants

Appendix



D.1

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July 2009



Legend

-  New Nylaflow® Tubing
-  Non-Dedicated Tubing

Soil Gas Purging and Sampling Assembly

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consultants

Appendix

D.2

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July 2009